Oracle® Database

Workspace Manager Developer's Guide

11*g* Release 2 (11.2)

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Provides usage and reference information about Oracle Workspace Manager, which enables applications to create workspaces and group different versions of table row values in different workspaces.

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Oracle Database Workspace Manager Developer's Guide, 11*g* Release 2 (11.2)

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Preface

Oracle Database Workspace Manager Developer's Guide describes Oracle Workspace Manager, often referred to as Workspace Manager, which enables applications to create workspaces and group different versions of table row values in different workspaces.

Audience

Oracle Database Workspace Manager Developer's Guide is intended for application designers and developers. It is assumed that you have some experience programming in PL/SQL.

Documentation Accessibility

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Related Documents

For more information about using this product in a development environment, see the following documents:

- *Oracle Call Interface Programmer's Guide*
- *Oracle Database Concepts*
- *Oracle Database PL/SQL Language Reference*

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

What's New in Workspace Manager?

This section describes new and changed Workspace Manager features for Oracle Database Release 11.

Release 11.2 Changes

The following are new and changed features for Oracle Database 11*g* Release 2 (11.2).

New DBMS_WM Subprograms

The following subprograms have been added to the DBMS_WM PL/SQL package, which is documented in Chapter 4:

- PurgeTable removes rows (all rows, or as limited by any combination of several parameters) from a version-enabled table, and optionally inserts them into an archive table.
- RenameSavepoint renames a savepoint in a specified workspace.
- RenameWorkspace renames a workspace.

Expanded Trigger Support for Version-Enabled Tables

The following enhancements have been made to the support for triggers on version-enabled tables:

- Before-update and after-update triggers for specific columns are now supported.
- Triggers specifying multiple DML operations are now supported. For example, you can specify the following:

  ```
  CREATE OR REPLACE TRIGGER user2.trig1 AFTER INSERT OR UPDATE OR DELETE ...
  ```

  In the previous release, you needed to create a separate trigger for each type of DML operation.

For information about using triggers on version-enabled tables, see Section 1.10.

Release 11.1 Changes

The following are new and changed features for Oracle Database 11*g* Release 1 (11.1).

Note: The title of this book has been changed, effective with this release. The previous title was *Oracle Database Application Developer's Guide - Workspace Manager*.

New Workspace Manager System Parameters

The following are new Workspace Manager system parameters for this release:

- ADD_UNIQUE_COLUMN_TO_HISTORY_VIEW
- COMPRESS_PARENT_AFTER_REMOVE
- KEEP_REMOVED_WORKSPACES_INFO
- ROW_LEVEL_LOCKING
- TARGET_PGA_MEMORY
- USE_SCALAR_TYPES_FOR_VALIDTIME

The Workspace Manager system parameters are documented in Section 1.5.

New Options for the AlterVersionedTable Procedure

The following new options are available for the alter_option parameter of the AlterVersionedTable procedure:

- REBUILD_INDEX, which has the following related new parameter_options parameter keywords: index_owner, index_name, and reverse and noreverse
- USE_SCALAR_TYPES_FOR_VALIDTIME and USE_WM_PERIOD_FOR_VALIDTIME (only one of which can be specified in each call to the procedure)

The AlterVersionedTable procedure is documented in Chapter 4.

New Parameter for the EnableVersioning Procedure

The validTimeRange parameter (WM_PERIOD DEFAULT NULL) has been added for the EnableVersioning procedure. With this parameter, if you enable valid time support when you version-enable a table, you can specify an initial valid time range.

The EnableVersioning procedure is documented in Chapter 4.

New Views for Removed Workspaces

The new ALL_REMOVED_WORKSPACES and USER_REMOVED_WORKSPACES views contain information about workspaces that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the remove_workspace parameter value was true, and while the value of the Workspace Manager system parameter KEEP_REMOVED_WORKSPACES_INFO was ON.

These views are documented in Chapter 5.

Merging Multiple Tables

You can use the MergeTable procedure to apply changes to multiple tables (all rows or as specified in the WHERE clause) in a workspace to its parent workspace. To specify multiple tables, specify them in the table_id parameter and separate the names with commas (for example, 'table1, table2'). In previous releases, you could specify only a single table name.

The MergeTable procedure is documented in Chapter 4.

Workspace ID Column Added to Static Data Dictionary Views

A numeric WORKSPACE_ID column has been added to the ALL_WORKSPACES and USER_WORKSPACES views.

These views are documented in Chapter 5.

User-Defined Hints

You can specify user-defined hints, which modify (and thus override) default optimizer hints, with the goal of improving the performance of SQL statements executed by the DBMS_WM package on a specified version-enabled table or all version-enabled tables. To add a user-defined hint, use the new AddUserDefinedHint procedure; to remove a user-defined hint, use the new RemoveUserDefinedHint procedure.

These procedures are documented in Chapter 4.

Adding, Merging, or Splitting Table Partitions

You can add, merge, and split table partitions in a version-enabled table by using the `alter_option` parameter to the AlterVersionedTable procedure, which is documented in Chapter 4.

Null Foreign Key Constraints

SET NULL foreign key constraints are now supported, and any such constraint is reflected in the ALL_WM_RIC_INFO metadata view with a row for which the DELETE_RULE column is set to `N`. (The value in this column does not affect behavior in any way; it only displays metadata about the table.) The ALL_WM_RIC_INFO metadata view is described in Section 5.11.

Oracle Label Security Policies and Version-Enabled Tables

If you need to perform DDL operations on a version-enabled table in an Oracle Label Security (OLS) environment, you can use the `apply_table_policy`, `remove_table_policy`, `enable_table_policy`, and `disable_table_policy` procedures of the SA_POLICY_ADMIN package on the skeleton (*_LTS*) table, and the changes will be transferred to the version-enabled table.

Part I

Conceptual and Usage Information

This document has three parts:

- Part I provides conceptual and usage information about Workspace Manager.
- Part II provides reference information about the Workspace Manager PL/SQL API (DBMS_WM package) and static data dictionary views.
- Part III provides supplementary information (appendixes and a glossary).

Part I is organized for efficient learning about Workspace Manager. It covers basic concepts and techniques first, and proceeds to more advanced material (such as Workspace Manager events and valid time support). Part I contains the following chapters:

1

Introduction to Workspace Manager

Oracle Workspace Manager, often referred to as Workspace Manager, provides an infrastructure that enables applications to create workspaces and group different versions of table row values in different workspaces. Users are permitted to create new versions of data to update, while maintaining a copy of the old data. The ongoing results of the activity are stored persistently, assuring concurrency and consistency.

Applications that can benefit from Workspace Manager typically do one or more of the following operations:

- Manage a collection of updates and insertions as a unit before incorporating them into production data

  You can review changes and roll back undesirable ones before making the changes public. Until you make the changes public, they are invisible to other users of the database, who will access only the regular production data. You can organize the changes in a simple set of workspaces or in a complex workspace hierarchy. A typical example might be a life sciences application in which Workspace Manager supports the discovery and quality assurance (QA) processes by managing a collection of updates before they are merged with the production data.

- Support a collaborative development effort

  A team can share access to a collection of updates and insertions for a collaborative project. Workspace privileges control access to a workspace and its operations, and you can restrict workspace access to single-writer, read-only, or no access. Workspace locks prevent update conflicts between projects in separate workspaces. A typical example might be an application to design an engineering project, in which multiple subprojects are concurrently developed in separate workspaces.

- Use a common data set to create multiple scenarios for *what-if* analyses or multiple editions of data for publication

  You can organize changes in workspaces to view them in the context of the whole database, but without requiring that you actually copy data between tables. Different users can make simultaneous changes to the same row, and you can detect and resolve conflicts. A typical example might be a telecommunications application in which you create multiple cell phone coverage scenarios to find the optimal design.

- Keep a history of changes to data

  You can navigate workspaces and row versions to view the database as of a particular milestone or point in time. You can roll back changes to a row or table in a workspace to a milestone. A typical example might be a land information

management application where Workspace Manager supports regulatory requirements by maintaining a history of all changes to land parcels.

Workspace Manager is also useful in managing *long-transaction* scenarios, where complex, long-duration database transactions can take days to complete, and multiple users must access the same database.

This chapter explains concepts and operations that you must understand to use Workspace Manager. It contains the following major sections:

For complete examples of Workspace Manager, see Section 1.17. However, you may want to read the rest of this chapter first, to understand the concepts that the examples illustrate.

Note: Workspace Manager is installed by default in the Oracle seed database and any database created using the Database Configuration Assistant (DBCA). To use Workspace Manager in any other Oracle database, you must first perform the installation procedure described in Appendix A, "Installing Workspace Manager with Custom Databases".

1.1 Workspace Manager Overview

Workspace Manager enables you to **version-enable** one or more user tables in the database. When a table is version-enabled, all rows in the table can support multiple versions of the data. The versioning infrastructure is not visible to the users of the database, and application SQL statements for selecting, inserting, modifying, and deleting data continue to work in the usual way with version-enabled tables, although you cannot update a primary key column value in a version-enabled table. (Workspace Manager implements these capabilities by maintaining system views and creating `INSTEAD OF` triggers, as explained in Section 1.1.11; however, application developers and users do not need to see or interact with the views and triggers.)

After a table is version-enabled, users in a workspace automatically see the correct version of the record in which they are interested. If you no longer need a table to be version-enabled, you can disable versioning for the table.

A **workspace** is a virtual environment that one or more users can share to make changes to the data in the database. A workspace logically groups collections of new row versions from one or more version-enabled tables, and isolates these versions until they are explicitly merged with production data or discarded, thus providing maximum concurrency. Users can perform a variety of operations involving workspaces: go to, create, refresh, merge, roll back, remove, compress, alter, and other operations.

Users in a workspace always see a transactionally consistent view of the entire database; that is, they see changes made in their current workspace plus the rest of the data in the database as it existed either when the workspace was created or when the workspace was most recently refreshed with changes from the parent workspace. (Workspace hierarchy and parent and child workspaces are explained in Section 1.1.1.)

Workspace Manager automatically detects **conflicts**, which are differences in data values resulting from changes to the same row in a workspace and its parent workspace. You must resolve conflicts before merging changes from a workspace into its parent workspace. You can use workspace locks to avoid conflicts.

Savepoints are points in the workspace to which row changes in version-enabled tables can be rolled back, and to which users can go to see the database as it existed at that point. Savepoints are usually created in response to a business-related milestone, such as the completion of a design phase or the end of a billing period. (For more information about savepoints, see Section 1.1.2.)

The **history option** enables you to timestamp changes made to all rows in a version-enabled table and to save a copy of either all changes or only the most recent changes to each row. If you keep all changes (specifying the "without overwrite" history option) when version-enabling a table, you keep a persistent history of all changes made to all row versions, and enable users to go to any point in time to view the database as it existed from the perspective of that workspace.

Workspace Manager provides a comprehensive PL/SQL API that you can add to new and existing applications to manage workspaces, savepoints, history information, privileges, access modes, and Workspace Manager locks, and to detect and resolve conflicts. You can also perform many of these operations using the Oracle Enterprise Manager graphical user interface.

Another database object created by Workspace Manager is a database-wide system table that maps row versions to workspaces. This table is not visible to users.

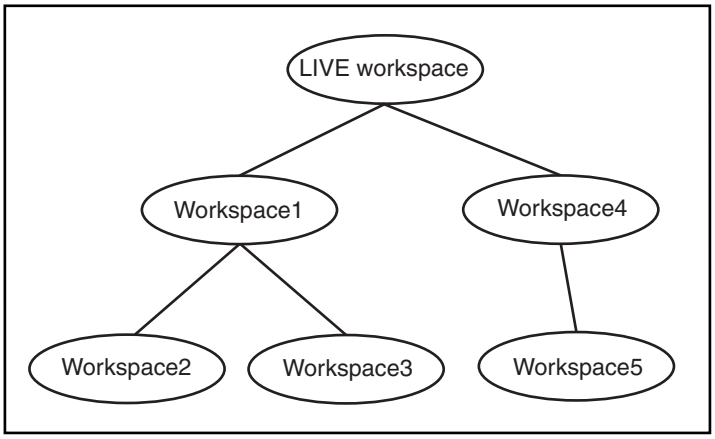
1.1.1 Workspace Hierarchy

There can be a hierarchy of workspaces in the database. For example, a workspace can be a parent to one or more workspaces (child workspaces). By default, when a workspace is created, it is created from the topmost, or `LIVE`, database workspace. (Workspace names are case-sensitive, and the workspace name of the live database is spelled `LIVE`. The length of a workspace name must not exceed 30 characters, and the depth of the workspace hierarchy must not exceed 30 levels.) Users are included in a workspace by a GotoWorkspace operation.

Figure 1–1 shows a hierarchy of workspaces. `Workspace1` and `Workspace4` were formed off the `LIVE` database workspace; `Workspace2` and `Workspace3` were formed off `Workspace1`, and `Workspace5` was formed off `Workspace4`. After `Workspace1` was created, a user executed a GotoWorkspace operation specifying

Workspace1, and then executed CreateWorkspace operations to create Workspace2 and Workspace3. A comparable sequence was followed with Workspace4 and Workspace5.

Figure 1–1 Workspace Tree



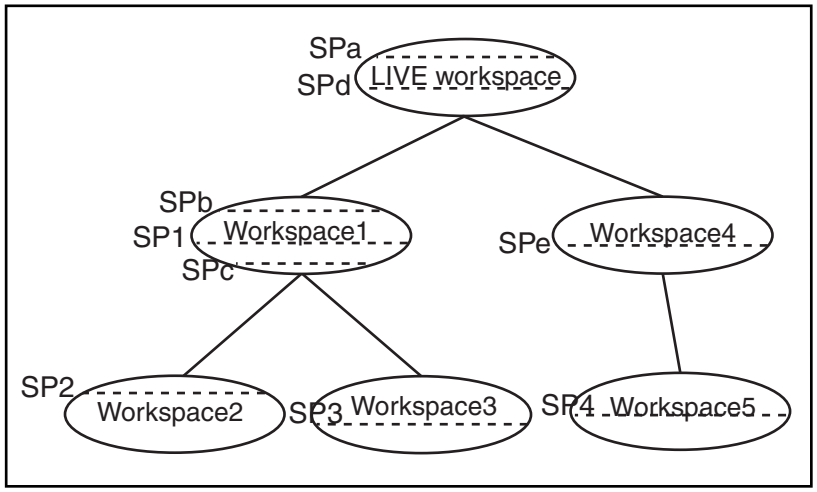
See also Section 1.1.2.1 for a discussion of design issues in deciding whether to create a child workspace or a savepoint for certain needs

1.1.2 Using Savepoints

A savepoint is a point in the workspace to which data changes can be rolled back. Workspace Manager accomplishes the rollback by deleting the row versions that contain the unwanted changes.

An **explicit savepoint** is a savepoint that you create and name. You can later roll back changes in version-enabled tables to the savepoint, or you can go to the savepoint to view the state of the entire database (including versioned rows) at the time the savepoint was created. In Figure 1–2, SP1, SP2, SP3, and SP4 are explicit savepoints that were created in the workspaces indicated. (Savepoints are indicated by dashed lines in Figure 1–2.)

Figure 1–2 Savepoints



In addition, **implicit savepoints** are created automatically whenever a new workspace is created. An implicit savepoint is needed so that the users in the child workspace get a view of the database that is frozen at the time of the workspace creation. Thus, in Figure 1–2 two implicit savepoints (`SPa` and `SPd`) are created in the `LIVE` workspace corresponding to `Workspace1` and `Workspace4` creation; two implicit savepoints (`SPb` and `SPc`) are created in `Workspace1` corresponding to `Workspace2` and `Workspace3` creation; and one implicit savepoint (`SPe`) is created in `Workspace4` corresponding to `Workspace5` creation.

Workspace Manager uses the name `LATEST` to designate a logical savepoint that refers to the latest version in the workspace. `LATEST` is often the default when a savepoint is an optional parameter for a `DBMS_WM` subprogram (procedure or function).

A **removable savepoint** is a savepoint that can be deleted by the CompressWorkspace, CompressWorkspaceTree, and DeleteSavepoint procedures. A savepoint is removable if either of the following applies:

- It is an explicit savepoint.
- It is an implicit savepoint that does not have any child dependencies.

1.1.2.1 Design Issue: Savepoint or Child Workspace?

A Workspace Manager design issue that you may face is whether to create a savepoint or a child workspace to "save" a project at a given point. Both a savepoint and a child workspace allow you to group a set of changes, compare changes in different row versions, and roll back a set of changes. However, creating a savepoint enables you to continue to make changes in the same workspace, and it allows other users in the workspace immediate access to the changes. (Changes in another workspace are not visible to users until the current workspace is refreshed or merged.) Creating a savepoint also makes it convenient to archive a set of changes, to which you can later roll back.

On the other hand, creating a child workspace is convenient for providing an isolated environment in which a complex set of changes can be made, completely removed from the parent workspace (for example, the production data). If you want to set up an independent environment for a scenario, and if regular users in the parent workspace do not need access to this scenario's data, you probably want to create a child workspace instead of simply creating a savepoint in the parent workspace.

1.1.3 Merging and Rolling Back Workspace Changes

Workspaces can be merged or rolled back.

Merging a workspace involves applying changes made in a child workspace to its parent workspace, after which the child workspace is removed. To merge a workspace, use the MergeWorkspace procedure.

Rolling back a workspace involves deleting either all data changes (row versions) made in the workspace or all changes made after an explicit savepoint.

- To roll back all changes made in the workspace, use the RollbackWorkspace procedure.
- To roll back changes made in the workspace after a savepoint, use the RollbackToSP procedure.

> **Note:** You cannot roll back to a savepoint if any implicit savepoints were created since the specified savepoint, unless you first merge or remove the descendent workspaces that caused the implicit savepoints to be created. For example, referring to Figure 1–2 in Section 1.1.2, the user in `Workspace1` cannot roll back to savepoint `SP1` until `Workspace3` (which caused implicit savepoint `SPc` to be created) is merged or removed.

A workspace cannot be rolled back when it has open database transactions. Rollback of a workspace leaves behind the workspace structure for future use; only the data in the workspace is deleted. (To completely remove a workspace, use the RemoveWorkspace procedure, as described in Section 1.1.6.)

1.1.4 Resolving Conflicts Before a Merge or Refresh Operation

When a child workspace is merged, the row changes in the child workspace are incorporated in its parent workspace; and when a child workspace is refreshed, row changes in the parent workspace are incorporated in the child workspace. When a row is changed in both the child and parent workspace, a data conflict is created. Conflicts are automatically detected when a merge or refresh operation is requested, and they are presented to the user in conflict (*xxx*_CONF) views. There is one conflict view for each table, as described in Section 5.49. This view lists the column values of the rows in the two workspaces involved in the conflict.

You must resolve conflicts manually by setting the workspace conflict context for the session and then using the ResolveConflicts procedure. For each conflict you can choose to keep the row from the child workspace, the row from the parent workspace, or the common base row (that is, no change: keep the original data values for the row). You must resolve the conflicts before you can perform a merge (MergeWorkspace) or refresh (RefreshWorkspace) operation.

The **base row** is the currently visible row at the time of the first update or delete operation in the child workspace. In the case of an insert operation, the base row does not exist, except if the inserted row was previously deleted in an ancestor version of a parent workspace, the base row is that deleted row. The **parent row** is the currently visible row in the parent workspace at the time of the conflict resolution, and the **child row** is the currently visible row in the child workspace at the time of the conflict resolution.

Absence of data is not a conflict. In these cases, you can use the *xxx*_DIFF view (described in Section 5.50) to detect a change in one workspace when there is no row or no change to the row in the other workspace.

The general process for resolving conflicts is as follows:

1. Use the GotoWorkspace or SetConflictWorkspace procedure to set the workspace conflict context for the session.
2. Examine the *xxx*_CONF views (described in Section 5.49) to see what conflicts exist.
3. Execute the BeginResolve procedure.
4. Execute the ResolveConflicts procedure as often as needed: once for each affected combination of table and workspace.
5. After resolving all conflicts, execute one of the following procedures:

- CommitResolve if you want to make permanent all changes from the preceding step. (However, the changes are not made permanent in the database until you perform a standard database commit operation and execute the MergeWorkspace or RefreshWorkspace procedure, as described in the next step.)
- RollbackResolve to discard all changes from the preceding step. (If you discard all changes, do not perform the next step.)

6. Perform a standard database commit operation and execute the MergeWorkspace or RefreshWorkspace procedure.

1.1.5 Freezing and Unfreezing Workspaces

You can control read and write access to a workspace by freezing and unfreezing the workspace. If a workspace is frozen, the ability of users to access the workspace and to make changes to rows in version-enabled tables is restricted. You can freeze a workspace in any of the following modes: no access, read-only, and one writer only (`1WRITER`).

To make a workspace frozen, use the FreezeWorkspace procedure. To make a frozen workspace not frozen, use the UnfreezeWorkspace procedure.

In addition, some procedures automatically freeze one or more workspaces. Table 1–1 lists these procedures, the workspaces affected, and the mode in which the workspaces are frozen. (For explanations of the mode values, see the FreezeWorkspace procedure description in Chapter 4.)

Table 1–1 Freeze Results of Procedures

Procedure	Workspace and Mode
BeginResolve	Specified workspace: `1WRITER`
MergeWorkspace	Specified workspace: `NO_ACCESS` Parent workspace: `READ_ONLY`
CompressWorkspace	Specified workspace: `NO_ACCESS` (Also, checks to ensure that there are no sessions on savepoints other than `LATEST`.)
CompressWorkspaceTree	Specified workspace: `NO_ACCESS` (Also, checks to ensure that there are no sessions on savepoints other than `LATEST`.)
CreateSavepoint	Specified workspace: `READ_ONLY`
DeleteSavepoint	Specified workspace: `NO_ACCESS`
CreateWorkspace	Specified workspace: `READ_ONLY`
RemoveWorkspace	Specified workspace: `NO_ACCESS`
RefreshWorkspace	Specified workspace: `READ_ONLY` Parent workspace: `READ_ONLY`
RollbackResolve	Specified workspace: `1WRITER`
RollbackWorkspace	Specified workspace: `NO_ACCESS`

1.1.6 Removing Workspaces

A workspace can be removed with the RemoveWorkspace procedure. RemoveWorkspace rolls back the data in a workspace and then deletes the workspace structure. An entire tree of workspaces can be removed with the

RemoveWorkspaceTree procedure. This will remove the workspace and all its descendant workspaces. A workspace cannot be removed when it has users in it.

1.1.7 Using Workspace Manager Events

Several types of Workspace Manager operations can be captured as events, and can be communicated to applications through the Oracle Advanced Queuing (AQ) framework. Messaging features provided by AQ, such as asynchronous notification, persistence, propagation, access control, history, and rule-based subscription, can be used for Workspace Manager events.

Support for Workspace Manager events includes the `ALLOW_CAPTURE_EVENTS` Workspace Manager system parameter, the SetCaptureEvent procedure, and the WM_EVENTS_INFO metadata view.

Chapter 2 describes Workspace Manager events and explains how to use them in applications.

1.1.8 Autocommitting of Workspace Manager Operations

Many Workspace Manager operations are by default executed as autonomous database transactions that will be committed when they finish. That is, each such transaction is an independent transaction that is called from within the current database transaction, leaves the context of the calling transaction, performs the Workspace Manager operation and then automatically commits it, and then returns to the calling transaction's context and continues with that transaction. Workspace Manager (`DBMS_WM`) subprograms that operate in this way have an optional `auto_commit` parameter, which has a default value of `TRUE`.

For example, the CompressWorkspace procedure by default starts an autonomous transaction, compresses the workspace, commits the compression operation, and returns to the calling transaction's context, where the current database transaction continues.

However, if you want such subprograms not to start an autonomous transaction, but instead to execute in the context of the calling transaction, you can specify the `auto_commit` parameter with a value of `FALSE`. In this case, the Workspace Manager operation is executed as part of the current database transaction; and if there is no current open transaction, the Workspace Manager operation starts a new transaction. In either case, the Workspace Manager operation does not take effect until that transaction ends with a commit operation. For example, if you call the CompressWorkspace procedure with the `auto_commit` parameter specified as `FALSE`, the workspace is not compressed until the transaction is committed; and if the transaction is rolled back, the workspace is not compressed.

Note that if you specify `FALSE` for the `auto_commit` parameter, you must remember to commit or roll back the transaction explicitly.

If the `auto_commit` parameter value is `TRUE` and any open transactions exist, the following considerations apply:

- For the CompressWorkspace and CompressWorkspaceTree procedures, an exception is raised if there is any open transaction.
- For all other Workspace Manager procedures, an exception is raised if there is an open transaction in a parent or child workspace of any table that needs to be modified.

1.1.9 Continually Refreshed Workspaces

A **continually refreshed workspace** is a workspace that is automatically refreshed from its parent workspace whenever data changes are committed in the parent workspace or are merged into the parent workspace from another child workspace. You do not need to call the RefreshWorkspace procedure for a continually refreshed workspace.

Any workspace in a branch of the workspace tree can be continually refreshed. A child workspace can be a continually refreshed workspace, regardless of whether its parent workspace is continually refreshed. However, if a parent workspace is a continually refreshed workspace, its child workspaces must also be continually refreshed.

To create a continually refreshed workspace, specify `TRUE` for the `isrefreshed` parameter in the call to the CreateWorkspace procedure. See the Usage Notes for the CreateWorkspace procedure for rules that apply to the creation of a continually refreshed workspace.

To change a workspace that is not continually refreshed to be continually refreshed, use the ChangeWorkspaceType procedure.

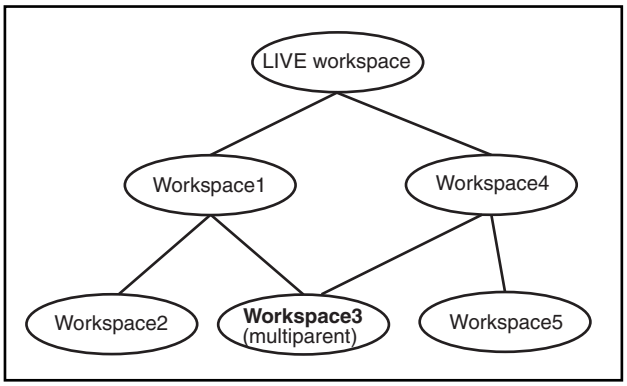
If a workspace is not continually refreshed, you must call the RefreshWorkspace procedure whenever you want to ensure that data changes in its parent workspace are visible in the workspace.

1.1.10 Multiparent Workspaces

A **multiparent workspace** is a child workspace that has two or more parent workspaces. A workspace is initially created with a single parent workspace. However, if the need arises, you can add other workspaces as parent workspaces to an existing workspace, thus making it a multiparent workspace. The multiparent workspace can see data from all of its parent workspaces and their ancestor workspaces, and it can be merged with and refreshed from its parent workspaces.

Figure 1–3 shows the same hierarchy of workspaces in Figure 1–1, except that `Workspace3` is now a multiparent workspace with two parent workspaces: `Workspace1` and `Workspace4`.

Figure 1–3 Multiparent Workspace in a Workspace Hierarchy



A multiparent workspace is also called a **multiparent leaf workspace**. Thus, in Figure 1–3, `Workspace3` is a multiparent leaf workspace. The nearest common

ancestor of all parent workspaces of a multiparent lead workspace is called the **multiparent root workspace**. In Figure 1–3, the LIVE workspace is the multiparent root workspace of Workspace3. All of the workspaces in the directed acyclic graph (DAG) formed as a result of adding parent workspaces as parents of a leaf workspace are called **multiparent graph workspaces**. In Figure 1–3, Workspace1, Workspace4, and Workspace3 are the multiparent graph workspaces.

Multiparent workspaces are allowed only if the ALLOW_MULTI_PARENT_WORKSPACE Workspace Manager system parameter is set to ON. In addition, for a continually refreshed workspace to be a multiparent workspace, the CR_WORKSPACE_MODE Workspace Manager system parameter must be set to PESSIMISTIC_LOCKING; and for a workspace that is not continually refreshed to be a multiparent workspace, the NONCR_WORKSPACE_MODE Workspace Manager system parameter must be set to PESSIMISTIC_LOCKING. For information about Workspace Manager system parameters, see Section 1.5.

To create a multiparent workspace, use the AddAsParentWorkspace procedure. To remove a workspace as a parent of a multiparent workspace, use the RemoveAsParentWorkspace procedure. To grant and revoke privileges on multiparent graph workspaces, use the GrantGraphPriv and RevokeGraphPriv procedures, respectively. These procedures are described in Chapter 4.

Workspace Manager provides the following static data dictionary views (described in Chapter 5) to store information about multiparent workspaces:

- USER_MP_GRAPH_WORKSPACES and ALL_MP_GRAPH_WORKSPACES contain information about multiparent graph workspaces.
- USER_MP_PARENT_WORKSPACES and ALL_MP_PARENT_WORKSPACES contain information about parent workspaces of multiparent leaf workspaces.

1.1.11 Infrastructure for Version-Enabling of Tables

When you version-enable a table using the EnableVersioning procedure, Workspace Manager automatically performs operations and creates data structures that are invisible to non-DBA users, but that permit Workspace Manager to function. Some of the information maintained by Workspace Manager is stored in the static data dictionary views described in Chapter 5, and some is stored in system data structures not accessible by users.

When a table is version-enabled, Workspace Manager renames the table to <*table-name*>_LT, and it adds several columns to this table to store versioning metadata. Note that users and applications should not specify the <*table-name*>_LT table in SQL statements; they should continue to specify the original table name (<*table-name*>). (If you ever need to find the name of the <*table_name*>_LT table associated with a version-enabled table, or if you want to find out if a table is version-enabled by checking for the existence of a <*table_name*>_LT table, use the GetPhysicalTableName function.)

Workspace Manager also creates a view on the original table (<*table-name*>), as well as INSTEAD OF triggers on the view for insert, update, and delete operations. When an application executes a statement to insert, update, or delete data in a version-enabled table, the appropriate INSTEAD OF trigger performs the actual operation. When the view is accessed, it uses the workspace metadata to show only the row versions relevant to the current workspace of the user.

Because Workspace Manager uses the original object name when it creates infrastructure objects, the effective maximum length of the name for some kinds of objects is shorter than the maximum permitted by Oracle Database. Table 1–2 provides

guidelines for the maximum name length for version-enabled tables and related objects. (See also the information in Section 1.15 about reserved words and characters for certain names.)

Table 1–2 Name Length Guidelines for Workspace Manager

Type of Object	Maximum Name Length in Characters
Table	25
Column	28
Index	30 (26 if the index is created or altered between calls to the BeginDDL and CommitDDL procedures)
Trigger	30 (24 in Release 11.2.0.1; fixed to 30 in 10.2.0.4.5 and 11.2.0.2)
Constraint	30 (26 if the constraint is created or altered between calls to the BeginDDL and CommitDDL procedures)

Workspace Manager does not support the RETURNING clause with INSERT, MERGE, or UPDATE statements on version-enabled tables. This restriction is caused by the fact that Workspace Manager creates views with `INSTEAD OF` triggers on version-enabled tables, and Oracle Database does not support the RETURNING clause on views that have `INSTEAD OF` triggers defined on them.

1.1.12 Creation of Row Versions and Historical Copies

This section describes the process by which Workspace Manager creates new row versions and maintains historical copies of old versions.

A new row version is created in a version-enabled table when you do either of the following:

- Create an explicit savepoint in the current workspace, and update the row.
- Create a child workspace (using the CreateWorkspace procedure) under the current workspace, thus creating an implicit savepoint in the current workspace; execute the GotoWorkspace procedure to go to the child workspace; and update the row.

Any subsequent update of the current row overwrites the current row version, unless history is enabled on the table or another savepoint is created.

- If history is enabled *without* overwrite (`VIEW_WO_OVERWRITE`), each update of the current row version creates a full copy of the current row version with the changes and with a timestamp based on the transaction time. This copy becomes the new current row version.
- If history is enabled *with* overwrite (`VIEW_W_OVERWRITE`), each update of the current row version overwrites the current row version and updates the transaction timestamp.
- If a savepoint is created in the workspace, the next change to the row creates a new version, and the history cycle begins again.

Row versions created in a workspace are not visible from that workspace until you execute the MergeWorkspace or MergeTable procedure.

When you execute the MergeWorkspace procedure for a child workspace, only the current row version in the child workspace is merged into the parent workspace. If you specify the `remove_workspace` parameter as `TRUE`, any intermediate row versions in the child workspace are deleted when the child workspace is removed. To

retain all intermediate versions created in the child workspace, the `remove_workspace` parameter value must be `FALSE` (the default).

When you execute the CompressWorkspace procedure on a child workspace to eliminate intermediate savepoints, you can also remove the associated historical copies of that row version. If you do not remove these copies, they are associated with the next version.

Intermediate row versions can only be selected for read-only access. To select an intermediate row version for read-only access, go to the workspace (GotoWorkspace procedure) if you are not already in it, and execute either the GotoDate procedure to set the session context to a historical time or the GotoSavepoint procedure to set the session context to a specific savepoint. Subsequent SELECT statements will select, for read-only access, the latest row version as of the specified date or savepoint.

1.1.13 Workspace Manager Schema, Metadata, and Package

Workspace Manager creates a user named `WMSYS`. The `WMSYS` schema is used to store all the metadata information for Workspace Manager. A PL/SQL package with the public synonym `DBMS_WM` contains the Workspace Manager subprograms (procedures and functions).

The following privileges are granted to the `PUBLIC` user group:

- `SELECT` privilege on Workspace Manager static data dictionary views (described in Chapter 5)
- `EXECUTE` privilege on the `DBMS_WM` package (described in Chapter 4)

1.2 Session Context Information for Workspace Manager

Users perform Workspace Manager operations within a standard Oracle session. (A session is a specific connection of a user to an Oracle instance through a user process; a session lasts from the time the user connects until the time the user disconnects or exits the database application.) When you perform Workspace Manager operations, information relating to the session context is automatically recorded.

The session context information includes the workspace name and a context value, and it determines what data the session can see in the workspace and what workspaces the session can enter. The context value is one of the following:

- `LATEST`: The session is currently set to the `LATEST` savepoint (explained in Section 1.1.2), and it can see changes as they are made in the workspace. The context is automatically set to `LATEST` when the session enters the workspace (using the GotoWorkspace procedure).
- A savepoint name: The session is currently set to a savepoint in the workspace. The session cannot see changes as they are made in the latest version of the workspace, but instead sees a static view of the data as of the savepoint creation time. The session context is set to the savepoint name after a call to the GotoDate procedure.
- An instant (a point in time): The session is currently set to a specific point in time. The session cannot see changes as they are made in the latest version of the workspace, but instead sees a static view of the data as of the specific time. The session context is set to an instant after a call to the GotoDate procedure. (The exact time point depends on the history option for tracking modifications, as set by the EnableVersioning procedure or modified by the SetWoOverwriteOFF or SetWoOverwriteON procedure.)

You can retrieve information about the session context by using the GetSessionInfo procedure. Retrieving this information can be useful if you need to know where a session is (workspace and context) -- for example, after you performed a combination of GotoWorkspace, GotoSavepoint, and GotoDate operations.

1.3 Lock Management with Workspace Manager

In addition to locks provided by regular Oracle database transactions, Workspace Manager provides two types of version locks. These locks are primarily intended to eliminate row conflicts between a parent workspace and a child workspace. You can enable locking for the workspace, the session, or specified rows, or some combination:

- Lock at the workspace level (SetWorkspaceLockModeON procedure) if the data changes are in one or a few workspaces, or if you want all data changes in the workspace to be locked.
- Lock at the session level (SetLockingON procedure) if the data changes are being made in many workspaces. When locking is enabled for a session, Workspace Manager locks rows in all workspaces in which the session participates.
- Lock specific rows (LockRows procedure) either to lock the rows before they are updated or to automatically lock rows after they are inserted (or updated if they satisfy the `WHERE` clause after the update).

Workspace or session locks persist for the duration of the workspace or session, respectively, or until the workspace is merged or rolled back.

Like database locks, Workspace Manager locks can be exclusive or shared:

- Exclusive locks - The locks are very similar to database transaction locks in that once an exclusive lock is placed on a record, no other user in the database can change the record except for the session (user) that locked it. When exclusive locking is enabled for a user, any row that the user changes is locked exclusively. In addition, the parent row to that row is also locked exclusively. Thus, exclusive locking can be used to eliminate data conflicts between a child and its parent workspace. (However, see Section 1.3.1 for information about row versions with exclusive locking, and how the timing of an exclusive lock with respect to an update operation can affect whether other users can update a row.)
- Shared locks - Once a shared lock is placed on a row, only users in the workspace in which it is locked are allowed to modify it. Shared locks are also placed on the parent version of the row, thus protecting the row from conflicts. The benefit of shared locks over exclusive locks is that all users in the workspace where the row is locked can access the row for changes. An ideal use for this kind of lock is on a row that needs to have no conflicts with its parent, but that needs to be changed by a collection of users participating in a group project. Note that shared locking must be individually enabled for each session in the workspace.

Workspace-exclusive locks and version-exclusive locks are forms of exclusive locking that control which users can and cannot change data values, but (unlike exclusive locking) they do not prevent conflicts from occurring. **Workspace-exclusive locks** lock rows such that only the user that set the lock can change the values in the current workspace; however, other users in other workspaces can change the values. **Version-exclusive locks** lock rows such that only the user that set the lock can change the values (and that user can be in any workspace); no other users (in any workspace) can change the values.

Table 1–3 indicates, for a row locked by a specific user in a specific workspace, which users in which workspaces can and cannot modify the row. For example, the first two

entries in Table 1–3 mean that when a shared (S) lock is placed on a row, any user in the workspace in which the row was locked can modify the row, but any user in a workspace different from the workspace in which the row was locked cannot modify the row.

Table 1–3 Workspace Manager Lock Modes and Data Modification Ability

Lock Mode	User	Workspace of User	Can Modify?
Shared (S)	Any user	Workspace in which row was locked	Yes
Shared (S)	Any user	Different from workspace in which row was locked	No
Exclusive (E)	User that locked the row	Workspace in which row was locked	Yes
Exclusive (E)	User that locked the row	Different from workspace in which row was locked	No
Exclusive (E)	Different user from the one that locked the row	Any workspace	No
Workspace Exclusive (WE)	User that locked the row	Any workspace	Yes
Workspace Exclusive (WE)	Different user from the one that locked the row	Different from workspace in which row was locked	Yes
Workspace Exclusive (WE)	Different user from the one that locked the row	Workspace in which row was locked	No
Version Exclusive (VE)	User that locked the row	Any workspace	Yes
Version Exclusive (VE)	Different user from the one that locked the row	Any workspace	No

Locking a row does not affect workspace merge, refresh, and rollback operations, but it affects what can be done with the row after these operations. You can control these workspace operations by using workspace privileges, calling the FreezeWorkspace procedure, and checking the workspace *xxx*_LOCK view or views (described in Section 5.52) before performing the operations.

The *xxx*_LOCK static data dictionary views (described in Section 5.52) contain information about locks in each version-enabled table.

For information about Workspace Manager locking with DML operations on tables with referential integrity constraints, see Section 1.9.1.1.

1.3.1 Exclusive Locking and Row Versions

The timing of an exclusive lock with respect to an update operation in a child workspace can affect which version, if any, of the row can be updated in a parent workspace. For example, when a table is version-enabled in the `LIVE` workspace, each original row is assigned version 0. Assume that a workspace named `W1` is created as a child of the `LIVE` workspace. When workspace `W1` is created, the following things happen:

- Version 1 is assigned to the `LIVE` workspace (but no additional row is created).
- Version 2 is assigned to workspace `W1` (but no additional row is created). Queries in workspace `W1` still return version 0 of the row that is in the `LIVE` workspace.

Using this example, if a user in workspace W1 places an exclusive lock on a row before it updates the row, only that user in workspace W1 can update the row. Specifically:

- Version 0 of the row is locked, preventing any update of the row from any workspace until the row is unlocked.
- The lock can be placed from workspace W1 (or a descendent workspace of W1) because version 0 is the current physical row for the workspace.
- When a user in workspace W1 updates the row, a new row (version 2) is created that is visible only from workspace W1 and any of its child workspaces.

However, if the row is not locked in the LIVE workspace and if a user in workspace W1 updates the row and then places an exclusive lock on the row, a user in the LIVE workspace can update the row. Specifically:

- A new row (version 2) is created that is visible only from workspace W1 and any of its child workspaces.
- Version 2 of the row is locked. No user in workspace W1 other than the user that placed the lock, or no user in any child workspace of W1, can update the row or create a new version of the row.
- Version 0 of the row in the LIVE workspace is not locked. If a user in the LIVE workspace or a sibling workspace of W1 updates the row, a new version (version 1) of the row is created. (Version 0 is not locked because it is no longer the current version of the row for users in workspace W1; rather, version 2 is the current version of the row in that workspace.)

In other words, an exclusive lock after an update does not lock previous versions of the row in workspaces above the locking workspace in the workspace tree or in other branches of the workspace tree.

1.4 Privilege Management with Workspace Manager

Workspace Manager provides a set of privileges that are separate from standard Oracle database privileges. Workspace Manager **workspace-level privileges** (with names in the form *xxx_WORKSPACE)* allow the user to affect a specified workspace, and **system-level privileges** (with names in the form *xxx_ANY_WORKSPACE)* allow the user to affect any workspace.

Table 1–4 lists the Workspace Manager privileges.

Table 1–4 Workspace Manager Privileges

Privilege	Description
ACCESS_WORKSPACE	Allows the user to go to a specified workspace. ACCESS_WORKSPACE or ACCESS_ANY_WORKSPACE privilege is needed for all other privileges.
ACCESS_ANY_WORKSPACE	Allows the user to go to any workspace. ACCESS_WORKSPACE or ACCESS_ANY_WORKSPACE privilege is needed for all other privileges.
CREATE_WORKSPACE	Allows the user to create a child workspace in a specified workspace.
CREATE_ANY_WORKSPACE	Allows the user to create a child workspace in any workspace.
REMOVE_WORKSPACE	Allows the user to remove a specified workspace.
REMOVE_ANY_WORKSPACE	Allows the user to remove any workspace.

Table 1–4 (Cont.) Workspace Manager Privileges

Privilege	Description
MERGE_WORKSPACE	Allows the user to merge the changes in a specified workspace to its parent workspace.
MERGE_ANY_WORKSPACE	Allows the user to merge the changes in any workspace to its parent workspace.
ROLLBACK_WORKSPACE	Allows the user to roll back the changes in a specified workspace.
ROLLBACK_ANY_ WORKSPACE	Allows the user to roll back the changes in any workspace.
FREEZE_WORKSPACE	Allows the user to freeze and unfreeze a specified workspace.
FREEZE_ANY_WORKSPACE	Allows the user to freeze and unfreeze any workspace.

Each privilege can be granted with or without the grant option. The **grant option** allows the user to which the privilege is granted to grant the privilege to other users.

The WM_ADMIN_ROLE role has all Workspace Manager privileges with the grant option. By default, the database administrator (DBA role) is granted the WM_ADMIN_ ROLE role. Thus, after you decide which users should be granted which privileges, either have the DBA grant the privileges, or have the DBA grant the WM_ADMIN_ROLE role to one or more selected users and have these users grant the privileges.

The GrantWorkspacePriv and GrantSystemPriv procedures are used to grant workspace-level privileges and system-level privileges, respectively.

The RevokeWorkspacePriv and RevokeSystemPriv procedures are used to revoke workspace-level privileges and system-level privileges, respectively. These procedures require that the user have sufficient privilege to revoke the specified privilege from the specified user. The user that granted a privilege can revoke it.

1.5 System Parameters for Workspace Manager

Workspace Manager provides a set of system parameters that allow a user with the WM_ADMIN_ROLE role (described in Section 1.4) to enforce global Workspace Manager-specific settings for the database. (These Workspace Manager system parameters are not Oracle initialization parameters. The only way to set Workspace Manager system parameters is to use the SetSystemParameter procedure, described in Chapter 4).

To set a system parameter, use the SetSystemParameter procedure. To get the current setting for a system parameter, use the GetSystemParameter procedure. Both procedures are described in Chapter 4.

Table 1–5 lists the Workspace Manager system parameters.

Table 1–5 Workspace Manager System Parameters

Parameter Name	Values
ADD_UNIQUE_COLUMN_TO_HISTORY_VIEW	ON adds columns to the xxx_HIST views (described in Section 5.51) of version-enabled tables. When a table is version-enabled with valid time support (described in Chapter 3), WM_ROWID (rowid) and WM_FLAG (integer) are added. When a table is version-enabled without valid time support, only the WM_ROWID column is added. These columns can be used to uniquely identify each row in the xxx_HIST views. For a table with valid time support, you must use the WM_ROWID column and the WM_FLAG column in any WHERE clauses. OFF (the default) does not add any columns to the xxx_HIST views.
ALLOW_CAPTURE_EVENTS	ON allows Workspace Manager events (described in Chapter 2) to be captured. Setting this parameter to ON causes some additional internal Workspace Manager processing operations; therefore, for performance reasons you should not set the value to ON unless you plan to capture events. OFF (the default) does not allow Workspace Manager events to be captured.
ALLOW_MULTI_PARENT_WORKSPACES	ON allows multiparent workspaces (described in Section 1.1.10) to be created. Setting this parameter to ON causes some additional internal Workspace Manager processing operations; therefore, for performance reasons you should not set the value to ON unless you plan to use multiparent workspaces. OFF (the default) does not allow multiparent workspaces to be created.
ALLOW_NESTED_TABLE_COLUMNS	ON allows tables containing a nested table column to be version-enabled. Setting this parameter to ON causes some additional internal Workspace Manager processing operations; therefore, for performance reasons you should not set the value to ON unless you plan to version-enable any tables with nested table columns. OFF (the default) does not allow tables containing a nested table column to be version-enabled.
COMPRESS_PARENT_AFTER_REMOVE	ON (the default) implicitly calls the CompressWorkspace procedure to compress the parent workspace after a RemoveWorkspace operation, or after a MergeWorkspace operation in which the remove_workspace parameter was set to true. OFF does not compress the parent workspace in these cases.
CR_WORKSPACE_MODE	OPTIMISTIC_LOCKING allows a record to be edited in two or more continually refreshed workspaces. If differences occur between parent and child workspaces, the record is considered to be in conflict, and the conflict must be resolved before the child workspace can be merged or refreshed. PESSIMISTIC_LOCKING does not allow a record to be edited in two or more continually refreshed workspaces. This setting ensures that there are no conflicts between parent and child workspaces. OPTIMISTIC_LOCKING is the default for new installations, but PESSIMISTIC_LOCKING is the default for upgrades from a version before release 9.2.0.2.

Table 1–5 (Cont.) Workspace Manager System Parameters

Parameter Name	Values
FIRE_TRIGGERS_FOR_NONDML_EVENTS	ON (the default) causes user-defined triggers on version-enabled tables to be fired when a workspace non-DML operation (such as MergeWorkspace or MergeTable) is executed, unless later overridden for specific triggers by the SetTriggerEvents procedure. OFF causes user-defined triggers on version-enabled tables not to be fired when a workspace non-DML operation (such as MergeWorkspace or MergeTable) is executed, unless later overridden for specific triggers by the SetTriggerEvents procedure.
KEEP_REMOVED_WORKSPACES_INFO	ON keeps information about any workspaces that are removed. This information will be available in the DBA_REMOVED_WORKSPACES, ALL_REMOVED_WORKSPACES, and USER_REMOVED_WORKSPACES views. ON also adds two new columns to xxx_HIST views (described in Section 5.51): WM_CREATEWORKSPACEID and WM_RETIREWORKSPACEID can be used to determine the workspace from which a row was merged and the workspace that merged a row that caused the row to be retired. OFF (the default) does not keep this information about any workspaces that are removed.
NONCR_WORKSPACE_MODE	OPTIMISTIC_LOCKING (the default for both new installations and upgrades) allows a record to be edited in two or more workspaces that are not continually refreshed. If differences occur between parent and child workspaces, the record is considered to be in conflict, and the conflict must be resolved before the child workspace can be merged or refreshed. PESSIMISTIC_LOCKING does not allow a record to be edited in two or more workspaces that are not continually refreshed. This setting ensures that there are no conflicts between parent and child workspaces.
NUMBER_OF_COMPRESS_BATCHES	A number from 1 to 1000, identifying the number of batches to be used when the batch_size parameter value is PRIMARY_KEY_RANGE and general statistics, but not histogram statistics, are available for a primary key column of type NUMBER, INTEGER, DATE, or TIMESTAMP. (See the reference information for any DBMS_WM subprogram that has a batch_size parameter.)
ROW_LEVEL_LOCKING	ON takes row-level locks on any rows that need to be merged or refreshed during MergeTable, MergeWorkspace, or RefreshWorkspace operations. This allows these procedures to run in parallel for workspaces that share the same parent. It allows multiple workspaces or session threads to issue merge or refresh requests concurrently against the same table; it does not parallelize a single merge or refresh operation that includes a list of tables. (However, parallel merge and refresh operations are supported only for tables without valid time support, and only for workspaces that are not continually refreshed.) The ON setting does not take effect for continually refreshed workspaces or if any of the tables that need to be merged or refreshed have valid time support enabled. OFF (the default) takes workspace-level locks for all workspace operations. This setting prevents MergeTable, MergeWorkspace, and RefreshWorkspace operations from running in parallel while operating on the same parent workspace.

Table 1–5 (Cont.) Workspace Manager System Parameters

Parameter Name	Values
TARGET_PGA_MEMORY	A number representing the maximum amount of memory, specified in bytes, that should be used for selecting rows into memory during any MergeTable, MergeWorkspace, or RefreshWorkspace operation. The default is 8388608 (8 megabytes). Workspace Manager uses this value to determine the optimal number of rows to fetch at any one time. This value does not affect the amount of memory used by other database processes, but only internal workspace operations.
UNDO_SPACE	A string containing UNLIMITED (for no specified limit) or a number representing the maximum number of bytes for undo space available for Workspace Manager operations. Example: '1048576' for 1 megabyte. Workspace manager tries to minimize the amount of undo space used in a single transaction so as not to exceed the UNDO_SPACE value. You can override the value of the UNDO_SPACE system parameter by specifying the undo_space parameter in the call to the EnableVersioning procedure.
USE_SCALAR_TYPES_ FOR_VALIDTIME	ON causes Workspace Manager to use two columns, named WM_VALIDFROM and WM_VALIDTILL, of type TIMESTAMP WITH TIME ZONE, instead of a single column named WM_ VALID (of type WM_PERIOD) to indicate the valid time range in views created on a version-enabled table that has valid time support. (The WM_PERIOD type is described in Section 3.2.) OFF (the default) causes Workspace Manager to a single column named WM_VALID (of type WM_PERIOD) to indicate the valid time range in views created on a version-enabled table that has valid time support. This parameter affects only tables that are subsequently version-enabled; it does not affect the views on existing version-enabled tables. To change the views on an existing version-enabled table, use the AlterVersionedTable procedure and specify the alter_option parameter value USE_ SCALAR_TYPES_FOR_VALIDTIME or USE_WM_PERIOD_FOR_ VALIDTIME.
USE_TIMESTAMP_TYPE_ FOR_HISTORY	ON (the default) causes Workspace Manager, if the Oracle database release is 9.0.1 or later, to use the TIMESTAMP WITH TIME ZONE type for CREATETIME and RETIRETIME columns. (See Section B.3 for information about using this type.) OFF causes Workspace Manager to use the DATE type for CREATETIME and RETIRETIME columns.

1.6 Import and Export Considerations

Workspace Manager supports the import and export of version-enabled tables in one of the following two ways: a full database import and export, and a workspace-level import and export through Workspace Manager procedures. No other export modes, such as schema, table, or partition level, are currently supported.

Full database import and export operations can be performed on version-enabled databases using the Oracle utilities; however, the following considerations and restrictions apply:

- A database with version-enabled tables can be exported to another Oracle database only if the other database has Workspace Manager installed and does not

currently have any version-enabled tables or workspaces (that is, other than the LIVE workspace).

- For an import operation using the Oracle Data Pump Import utility, if the dump file includes the WMSYS schema, you must specify table_exists_action=truncate. If the dump file does not include the WMSYS schema, you can specify table_exists_action=append if the version-enabled tables being imported do not yet exist or are empty. (In general, dump files generated by Oracle Database release 10.2 or later will not include the WMSYS schema, while dump files generated by earlier releases will include the WMSYS schema.)

  The dump files must be from compatible versions of Workspace Manager. In general, Workspace Manager kits released at the same time, such as for a specific Oracle Database release, are compatible with each other.
- If you are using Data Pump Import, the dump file must have been created using Data Pump Export. (If you are using the original Import utility, the dump file must have been created using the original Export utility.)
- The REMAP_SCHEMA capability in Data Pump Import utility is not supported with version-enabled databases. (In the original Import utility, the FROMUSER and TOUSER capabilities are not supported with version-enabled databases.)
- If you are using the original Import utility, you must specify IGNORE=Y.

For workspace-level export operations, each version-enabled table can be exported at the workspace level. Follow these steps to export a version-enabled table from one database into another database:

1. Call the Export procedure to store all of the data that needs to be exported into a staging table (for example, t1). The data that is exported can either be all of the data as seen from a particular workspace, savepoint, or instant, or only the data that was modified in the particular workspace. See the information about the Export procedure in Chapter 4 for more details.

   Note: Tables with valid time support (that is, with a column named WM_VALID of type WM_PERIOD) are not supported with the Export procedure. (Valid time support is explained in Chapter 3.)

   To export multiple workspaces for a version-enabled table, call the Export procedure again, specifying the new workspace that needs to be exported as well as the original staging table. If you intend to import the data into a non-versioned table, specify the versioned_db parameter as FALSE.
2. Export the staging table (for example, t1), using the Oracle Data Pump Export utility or the original Export utility.
3. Import the staging table (for example, t1), using the Oracle Data Pump Import utility or the original Import utility, into the destination database.
4. If you are importing into a version-enabled table, call the Import procedure to move the data from the staging table to the version-enabled table, specifying the workspace where the data resided on the source database and the workspace into which the data should be stored.

   The structure of the staging table must match that of the version-enabled table. By default, all enabled constraints must be validated before the import procedure successfully completes.

1.7 Bulk Loading into Version-Enabled Tables

You can use SQL*Loader to perform bulk loading into version-enabled tables, but you must also call some special Workspace Manager procedures, and some restrictions apply. You can perform both direct-path and conventional-path bulk loading of data into either the latest version of any workspace or into the root version (version number 0, which is in the `LIVE` workspace). The root version is the ancestor of all other versions, so data in the root version is visible from all other workspaces (unless non-`LIVE` workspaces have updated the data).

Follow these general steps for bulk loading into a version-enabled table:

1. Call the GetBulkLoadVersion function to fetch the reserved version number with which the bulk loaded data needs to be tagged. All data bulk loaded into the versioned table needs to be tagged with a version number that depends upon the final destination of the data, namely, the latest version of a workspace or the root version. Use the version number returned by the GetBulkLoadVersion function in the SQL*Loader control file, as explained in step 3.
2. Call the BeginBulkLoading procedure to prepare the table for bulk loading. When data is being bulk loaded into a version-enabled table, DML and workspace operations on the table are not allowed, although workspace operations that do not involve this table are allowed. The BeginBulkLoading procedure prevents invalid operations from being performed on this table.
3. Use SQL*Loader to perform the bulk loading. Only one line needs to be changed in the control file, to specify the *<table_name>*`_LT` name and to include the version number fetched in step 1. For example, assume that the existing control file has the following line:

   ```
   Load data  into table departments (name, loc)
   ```

   If the version number fetched in step 1 is 5, the line in the control file for bulk loading into the version-enabled table should be changed to:

   ```
   Load data into table departments_LT (name, loc, version constant '5')
   ```

   This ensures that all the bulk-loaded rows will be tagged with version 5, and that the other Workspace Manager-specific columns for these rows will have null values. If the table was version-enabled with the history option, create and retire times can be bulk loaded into the `createtime` and `retiretime` columns of *<table_name>*`_LT`.
4. Complete the bulk loading process by calling either the CommitBulkLoading procedure to commit the bulk loading changes or the RollbackBulkLoading procedure to roll back the bulk loading changes.

If you commit the bulk loading changes, Workspace Manager ensures that the data is updated in the required workspace and version. By default, the bulk-loaded data is checked for each unique or referential constraint defined on the table, and any bulk-loaded rows that are in violation of any constraints are moved to a discards table specified as a parameter to the CommitBulkLoading procedure. If you specified to check for duplicates (that is, records in the data to be bulk loaded that have the same values in the primary key columns), for any duplicate records only the record with the lowest ROWID value is loaded into the table, and the rest are moved to the discards table.

The following restrictions apply to bulk loading with version-enabled tables in the current release:

- Bulk loading into a table with a self-referential integrity constraint is not allowed.

- Bulk loading into a workspace, other than LIVE, that has continually refreshed child workspaces is not allowed.
- Only the owner of a table or a user with the WM_ADMIN_ROLE role can bulk load into a version-enabled table.
- The user that is bulk loading the version-enabled table must have the INSERT privilege for <*table_name*>_LT.
- User-defined triggers on version-enabled tables are not executed during bulk loading.
- Session locking mode is not enforced for the bulk-loaded rows. Use the LockRows procedure to lock these rows.

1.8 DDL Operations Related to Version-Enabled Tables

To perform DDL (data definition language) operations on a version-enabled table, you must use special Workspace Manager procedures before and after the DDL operations, and you must specify the name of a special table created by Workspace Manager. You cannot perform DDL operations in the usual manner on the table or any index or trigger that refers to the table. For example, to add a column to a table named EMPLOYEES that has been version-enabled, you cannot simply enter a statement in the form ALTER TABLE EMPLOYEES ADD (*column-name data-type*).

The reason for these requirements is to ensure that Workspace Manager versioning metadata is updated to reflect the DDL changes. Therefore, DDL operations affecting a version-enabled table must be preceded by a call to the BeginDDL procedure, and must be concluded by a call to either the CommitDDL or RollbackDDL procedure. The BeginDDL procedure creates an empty temporary table with a name in the form <*table-name*>*_LTS* (the *S* standing for *skeleton*). The actual DDL statement must specify the name of the temporary <*table-name*>*_LTS* table, and must not specify the <*table-name*> or <*table-name*>*_LT* name. The CommitDDL and RollbackDDL procedures delete the temporary <*table-name*>*_LTS* table.

> **Note:** An exception to this procedure is adding valid time support to an existing version-enabled table. To add valid time support, use the AlterVersionedTable procedure, as explained in Section 3.10.

The following DDL operations related to version-enabled tables are supported:

- Table-related: Modifying the following table properties: logging, pctfree, pctused, initrans, next, minextents, maxextents, pctincrease, freelists, and buffer_pool
- Column-related: ADD, DROP, MODIFY (but for MODIFY only the following operations: changing the default value of a column; changing the data type of a column that contains only null values or for which there are no existing data rows; changing the length of a column of type VARCHAR2, VARCHAR, CHAR, NCHAR, NVCHAR, or NVCHAR2; changing the scale or precision of a column of type NUMBER)

  Note that any new length, scale, or precision for a column should be adequate for any existing data in the column.
- Index-related: CREATE INDEX, DROP INDEX, ALTER INDEX (but for ALTER INDEX only the following options: logging, pctfree, initrans, initialextent, minextents, nextextent, maxextents, pctincrease, freelists, freelist groups, and buffer_pool)

If the name of the index on a version-enabled table is longer than 26 characters, you must use the AlterVersionedTable procedure if you want to rename the index; you cannot use the ALTER INDEX statement with the RENAME clause. If the name of the index on a version-enabled table is 26 or fewer characters long, you can do either of the following to rename the index: use the AlterVersionedTable procedure, or use the ALTER INDEX statement with the RENAME clause between calls to the BeginDDL and CommitDDL procedures. See the Usage Notes for AlterVersionedTable for more information.

- Trigger-related: `CREATE TRIGGER`, `DROP TRIGGER`, `ALTER TRIGGER ENABLE/DISABLE`
- Referential integrity constraint-related: add, drop, enable, or disable a referential integrity constraint. For information about Workspace Manager referential integrity support, see Section 1.9.1.
- Unique constraint-related: add, drop, enable, or disable a unique constraint. For information about Workspace Manager unique constraint support, see Section 1.9.2.
- Privilege-related: grant table-level privileges to users and revoke these privileges from users.

You can create the following types of indexes on version-enabled tables: normal, bitmap, function-based normal, function-based bitmap, and domain. You cannot create or drop a partitioned, reverse, or join index on a version-enabled table. (You can, however, version-enable a table that has a partitioned, reverse, or join index.)

If you try to perform an unsupported DDL operation, the change will not be made, and an exception might be raised by the CommitDDL procedure.

If the DDL operation involving a version-enabled table is on a domain index (for example, creating an R-tree index on the table), you must have the `CREATE TABLE` privilege.

If you need to perform DDL operations on a version-enabled table in an Oracle replication environment, see Section C.3 for additional guidelines.

If you need to perform DDL operations on a version-enabled table in an Oracle Label Security (OLS) environment, you can use the `apply_table_policy`, `remove_table_policy`, `enable_table_policy`, and `disable_table_policy` procedures of the SA_POLICY_ADMIN package on the skeleton (*_LTS*) table, and the changes will be transferred to the version-enabled table.

Example 1–1 shows the statements needed to add a column named `COMMENTS` to the `COLA_MARKETING_BUDGET` table by using the special table named `COLA_MARKETING_BUDGET_LTS`. It also includes a `DESCRIBE` statement to show the addition of the column.

Example 1–1 DDL Operation on a Version-Enabled Table

```
EXECUTE DBMS_WM.BeginDDL('COLA_MARKETING_BUDGET');
ALTER TABLE cola_marketing_budget_lts ADD (comments VARCHAR2(100));
DESCRIBE cola_marketing_budget_lts;

 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PRODUCT_ID                                NOT NULL NUMBER
 PRODUCT_NAME                                       VARCHAR2(32)
 MANAGER                                            VARCHAR2(32)
 BUDGET                                             NUMBER
 COMMENTS                                           VARCHAR2(100)
```

```
EXECUTE DBMS_WM.CommitDDL('COLA_MARKETING_BUDGET');
```

In Example 1–1, the ALTER TABLE statement specifies the COLA_MARKETING_BUDGET_LTS table, which is created by the BeginDDL procedure. The CommitDDL procedure applies the change to the COLA_MARKETING_BUDGET table and deletes the COLA_MARKETING_BUDGET_LTS table.

1.9 Constraint Support with Workspace Manager

This section describes Workspace Manager considerations relating to the use of database constraints.

1.9.1 Referential Integrity Support

Version-enabled tables can have referential integrity constraints, including constraints with the CASCADE and RESTRICT options; however, the following considerations and restrictions apply:

- If the parent table in a referential integrity relationship is version-enabled, the child table must be version-enabled also. (The child table is the one on which the constraint is defined.) For example, consider the following EMPLOYEE and DEPARTMENT table definitions, with a foreign key constraint added after the creation (that is, the dept_id value in each EMPLOYEE row must match an existing dept_id value in a DEPARTMENT row).

  ```
  CREATE TABLE employee (
    employee_id NUMBER,
    last_name VARCHAR2(32),
    first_name VARCHAR2(32),
    dept_id NUMBER);
  CREATE TABLE department (
    dept_id NUMBER,
    name VARCHAR2(32);
  ALTER TABLE employee ADD CONSTRAINT emp_forkey_deptid
    FOREIGN KEY (dept_id) REFERENCES department (dept_id)
    ON DELETE CASCADE;
  ```

  In this example, DEPARTMENT is considered the parent and EMPLOYEE is considered the child in the referential integrity relationship; and if DEPARTMENT is version-enabled, EMPLOYEE must be version-enabled also. In this relationship definition, when a DEPARTMENT row is deleted, all its child rows in the EMPLOYEE table are deleted (cascading delete operation).

- A child table in a referential integrity relationship is allowed to be version-enabled without the parent table being version-enabled.
- The foreign key in a child table must refer to the primary key in the parent table.
- Primary key values in the parent table cannot be updated. For example, if DEPARTMENT is the parent table and EMPLOYEE is the child table, you cannot change the department ID of a department.
- Multilevel referential integrity constraints are permitted on version-enabled tables. For example, the table EMPLOYEE(emp_id, dept_id) could have the constraint that the department ID must exist in the table DEPARTMENT(dept_id, dept_name, loc_id); and the table DEPARTMENT(dept_id, dept_name, loc_id) could have the constraint that the location ID must exist in the table LOCATION(loc_id, loc_name). However, all tables that are involved in

multilevel referential integrity constraints must be version-enabled and version-disabled together, unless all the referential integrity constraints involved have the `Restrict` rule. If all the constraints involved have the `Restrict` rule, you can version-enable the tables either all together or one at a time with child tables preceding their parent tables. The table names must be passed as a comma-delimited list to the EnableVersioning and DisableVersioning procedures.

Workspace Manager uses the static data dictionary views ALL_WM_RIC_INFO and USER_WM_RIC_INFO (described in Chapter 5) to hold information pertinent to referential integrity support.

If you need to add, drop, enable, or disable a referential integrity constraint that involves two tables, it is more convenient if you perform the operation before version-enabling the tables. However, you can add, drop, enable, or disable a referential integrity constraint that involves two version-enabled tables if you follow these steps:

1. Begin a DDL session specifying the parent table.
2. Begin a DDL session specifying the child table.
3. Alter the *<table-name>_LTS* table for the child table to add the foreign key constraint. (See Section 1.8 for information about *<table-name>_LTS* tables and performing DDL operations on version-enabled tables.)
4. Commit the DDL changes specifying the child table.
5. Commit the DDL changes specifying the parent table.

Example 1–2 adds a foreign key constraint. Assume that the `EMPLOYEE` and `DEPARTMENT` tables are version-enabled and are defined as follows:

```
EMPLOYEE(emp_id number  primary key, dept_id number)
DEPARTMENT(dept_id number  primary key, dept_name varchar2(30))
```

Example 1–2 Adding a Referential Integrity Constraint

```
-- Begin a DDL session on the parent table.
DBMS_WM.BeginDDL('DEPARTMENT');

-- Begin a DDL session on the child table.
DBMS_WM.BeginDDL('EMPLOYEE');

-- Add the constraint between EMPLOYEE_LTS and DAPATMENT_LTS.
ALTER TABLE employee_lts ADD CONSTRAINT employee_fk FOREIGN KEY (dept_id)
   REFERENCES department_lts(dept_id);

-- Commit DDL on the child table (transfers the constraint on employee_lts
-- to employee and drops employee_lts).
EXECUTE DBMS_WM.CommitDDL('EMPLOYEE');

-- Commit DDL on the parent table (drops the department_lts table).
EXECUTE DBMS_WM.CommitDDL('DEPARTMENT');
```

If you are in a DDL session (that is, if you have called the BeginDDL procedure), you cannot add, drop, enable, or disable a referential integrity constraint that involves two tables if one table is version-enabled and the other is not version-enabled. Both tables must be version-enabled.

1.9.1.1 Locking with DML Operations on Tables with Referential Integrity Constraints

When data manipulation language (DML) operations are performed on version-enabled tables that have referential integrity constraints, Workspace Manager acquired shared locks so that the following conditions are enforced:

- During an insert operation or an update operation affecting the foreign key column on the child table, delete operations cannot be performed on the parent table. For example, if `DEPARTMENT` is the parent table and `EMPLOYEE` is the child table, during the time that a new employee is being added or an existing employee is being assigned to a different department, no departments can be deleted.
- During a delete operation on the parent table, insert operations or updates operation affecting the foreign key column cannot be performed on the child table. For example, during the time that a department is being deleted, new employees cannot be added and existing employees cannot be assigned to different departments.

> **See also:** For general information about locking performed by Workspace Manager, including explanations of shared and exclusive locks, see Section 1.3.

Multiple sessions can simultaneously perform either of the following, but not both of the following, DML operations simultaneously:

- Insert operations or update operations affecting the foreign key column on the child table
- Delete operations on the parent table

Multiple sessions can simultaneously perform any of the following Workspace Manager operations simultaneously:

- Use the MergeTable procedure to apply changes to a child table or parent table in different workspaces.
- Use the MergeTable procedure to apply changes to a child table in one workspace, and insert or update the child table in another workspace.
- Use the MergeTable procedure to apply changes to a parent table in one workspace, and delete from the parent table in another workspace.

One session will be blocked until the other session finishes in the following situations:

- A session tries to merge changes to a child table in one workspace, and another session tries to merge changes to the parent table in another workspace.
- A session tries to merge changes to a child table in one workspace, and another session tries to delete from the parent table.
- A session tries to merge changes to a parent table in one workspace, and another session tries to insert into a child table or change a value in the foreign key of a child table.

1.9.2 Unique Constraints

Tables with unique constraints defined on them can be version-enabled. The following are supported:

- `UNIQUE` constraint on a single column or multiple columns

- Unique index on a single column or multiple columns
- Functional unique index on the table

The treatment of null values is the same for version-enabled tables as for tables that are not version-enabled.

Workspace Manager uses the following static data dictionary views (described in Chapter 5) to hold information pertinent to support for unique constraints:

- ALL_WM_CONSTRAINTS and USER_WM_CONSTRAINTS contain information about columns in unique constraints on version-enabled tables.
- ALL_WM_CONS_COLUMNS and USER_WM_CONS_COLUMNS contain information about constraints on version-enabled tables.
- ALL_WM_IND_COLUMNS and USER_WM_IND_COLUMNS contain information about indexes used for enforcing unique constraints on version-enabled tables.
- ALL_WM_IND_EXPRESSIONS and USER_WM_IND_EXPRESSIONS contain information about functional expressions on functional unique indexes on version-enabled tables.

1.9.3 SET NULL Constraints

`SET NULL` constraints are not supported by Workspace Manager. If a table has any `SET NULL` constraints, they are converted to the `RESTRICT` option when the table is version-enabled.

For example, the constraint `ON DELETE SET NULL` is converted to `ON DELETE RESTRICT`.

1.10 Triggers on Version-Enabled Tables

Version-enabled tables can have triggers defined; however, the following considerations and restrictions apply:

- Only per-row triggers are supported. Per-statement triggers are not supported.
- The only call-out supported is to PL/SQL procedures. That is, the `action_type` must be PL/SQL.

Any triggers that are not supported for version-enabled tables are deactivated when versioning is enabled, and are activated when versioning is disabled.

You can selectively enable specific user-defined triggers for certain kinds of events by using the SetTriggerEvents procedure.

1.11 Virtual Private Database Considerations

You can use Workspace Manager in conjunction with the Oracle Virtual Private Database (VPD) technology. (Virtual private databases are described in *Oracle Database Security Guide*.) However, the following considerations apply Workspace Manager in a VPD:

- Row-level security policies are not enforced during workspace operations, such as MergeWorkspace. A call to MergeWorkspace will merge all the changes made in a workspace, not just the changes that the current user can see. You can use Workspace Manager privileges (such as `MERGE_WORKSPACE`) to control workspace operations.

- Row-level security policies cannot be defined on a version-enabled table by defining them only on the specified table (<table_name>). Instead, you must define row-level security policies on all of the following that exist: <*table_name*>, <*table_name*>_LOCK, <*table_name*>_CONF, <*table_name*>_DIFF, and <*table_name*>_HIST. Do not use the Workspace Manager DDL framework described in Section 1.8 (that is, do not use the BeginDDL and CommitDDL procedures) when defining row-level security policies.

1.12 Support for Table Synonyms

For any Workspace Manager procedure or function input parameter that calls for a table name, you can instead specify a synonym. When Workspace Manager looks for a table, it searches in the following sequence and uses the first match for the specified name:

1. A table in the specified schema (or local schema if no schema is specified)
2. A private synonym in the specified schema (or local schema if no schema is specified)
3. A public synonym

1.13 Materialized View Support

This section describes considerations for using Workspace Manager with materialized views.

You can create a materialized view on a version-enabled table only if you specify the complete refresh method (`REFRESH COMPLETE`) when you create the materialized view. You cannot specify any of the following clauses in the `CREATE MATERIALIZED VIEW` statement:

- `FAST` (incremental refresh)
- `ON COMMIT`
- `FOR UPDATE`

You cannot version-enable a materialized view or the base table of a materialized view.

When the materialized view is created, its content is based on the workspace in which the session is at that time. When the materialized view is refreshed, its content is based on the workspace in which the session is when the DBMS_MVIEW.REFRESH operation is performed. When the materialized view is created or refreshed, it shows the same data in all workspaces.

1.14 Spatial Topology Support

This section describes special considerations and techniques for using Workspace Manager with tables in Oracle Spatial topologies, which are documented in *Oracle Spatial Topology and Network Data Models Developer's Guide*.

A topology consists of feature tables, as well as tables with names in the form *<topology-name>*`_NODE$`, *<topology-name>*`_EDGE$`, *<topology-name>*`_FACE$`, *<topology-name>*`_RELATION$`, and *<topology-name>*`_HISTORY$`. If you want to version-enable any topology tables, you must version-enable all tables associated with the topology. To do so, you must specify the topology name as the `table_name` parameter to the EnableVersioning procedure, and you must specify the `isTopology` parameter as `TRUE`. For example:

```
EXECUTE DBMS_WM.EnableVersioning(table_name => 'xyz_topo', isTopology => TRUE);
```

The preceding example version-enables the xyz_topo topology; that is, it version-enables all feature tables associated with the xyz_topo topology, as well as the XYZ_TOPO_NODE$, XYZ_TOPO_FACE$, XYZ_TOPO_EDGE$, XYZ_TOPO_RELATION$, and XYZ_TOPO_HISTORY$ tables.

A version-enabled topology must have at least one feature table.

To disable versioning on any topology tables, you must disable versioning on all tables associated with the topology by specifying the topology name as the table_name parameter to the DisableVersioning procedure and the isTopology parameter as TRUE.

However, exceptions apply to the preceding guidelines about version-enabling and version-disabling topology tables in the following cases:

- If a feature table of a topology is the child table of a referential integrity constraint with CASCADE option with a table that is not in the topology
- If a feature table of a topology is the parent table of a referential integrity constraint with a table that is not in the topology

In these cases, you must version-enable or version-disable the feature table separately. That is, first call the EnableVersioning or DisableVersioning procedure on the feature table (along with any tables required by the referential integrity constraint), and then invoke the EnableVersioning or DisableVersioning procedure specifying the topology name.

1.14.1 Locking Considerations with Topologies

To lock or unlock rows in tables associated with a topology, you must specify the topology name as the table_name parameter to the LockRows or UnlockRows procedure, and you must identify the window containing the rows by using the Xmin, Ymin, Xmax, and Ymax parameters. You must also not specify the where_clause parameter. For example:

```
EXECUTE DBMS_WM.LockRows (workspace => 'ws1', table_name => 'xyz_topo', Xmin =>
0.1, Ymin => 0.1,  Xmax => 0.5, Ymax => 0.5 );
```

The preceding example puts version locks on all the rows of the specified topology contained in the specified window. To edit the elements of a topology in a workspace (including the LIVE workspace), follow these steps:

1. Invoke the LockRows procedure to put version locks on all the elements of the topology contained in a window of interest.
2. Invoke the Oracle Spatial Topology Java client loadWindow method for the same window of interest.

1.14.2 Additional Considerations with Topologies

The following additional considerations apply to using Workspace Manager with Spatial topologies:

- You must invoke the SDO_TOPO.INITIALIZE_METADATA procedure at least once on a topology before you version-enable the tables associated with the topology. (You can also invoke the SDO_TOPO.INITIALIZE_METADATA procedure as needed after version-enabling a topology.)

- Do not use the MergeTable, RefreshTable, or RollbackTable procedure on a version-enabled table associated with a topology. Instead, use the MergeWorkspace, RefreshWorkspace, or RollbackWorkspace procedure to merge, refresh, or roll back tables associated with a topology.

1.15 Reserved Words and Characters

Because Workspace Manager creates internal objects using its own naming conventions, you must avoid some words and characters in the names for certain kinds objects. Table 1–6 lists kinds of objects and restrictions that apply to their names. (See also the name length guidelines in Table 1–2 in Section 1.1.11.)

Table 1–6 Workspace Manager Reserved Words and Characters

Object	Name Cannot Be Any of the Following
Workspace	`BASE`, `LIVE`, or a string containing any of the following characters: `/` (slash), `*` (asterisk), `,` (comma), `$` (dollar sign), `#` (pound sign)
Version-enabled table	A string ending with `_G`
Column in a version-enabled table	`VERSION`, `NEXTVER`, `DELSTATUS`, `LTLOCK`, `CREATETIME`, `RETIRETIME`, or a string starting with `WM$` or `WM_` In addition, if the table includes valid time support (explained in Chapter 3), `RID` cannot be used as a column name.
Index on a version-enabled table	A string starting with `_PKI$` or `_TI$`

1.16 DBMS_WM Subprogram Categories

The Workspace Manager application programming interface (API) consists of PL/SQL subprograms (procedures and functions) in a single PL/SQL package named `DBMS_WM`. The subprograms can be logically grouped into the categories described in this section.

> **Note:** Most Workspace Manager subprograms are procedures, but a few are functions. (A function returns a value; a procedure does not return a value.)
>
> Most functions have names starting with *Get* (such as GetConflictWorkspace and CreateSavepoint).

Reference information for all subprograms is in Chapter 4.

1.16.1 Table Management Subprograms

Table management subprograms enable and disable workspace management on a table, and perform other table-related operations.

Table 1–7 shows the subprograms available for table management.

Table 1–7 Table Management Subprograms

Procedure	Description
EnableVersioning	Version-enables a table, creating the necessary structures to enable the table to support multiple versions of rows.

Table 1–7 (Cont.) Table Management Subprograms

Procedure	Description
DisableVersioning	Deletes all support structures that were created to enable the table to support versioned rows.
SetWoOverwriteOFF	Disables the `VIEW_WO_OVERWRITE` history option that was enabled by the EnableVersioning or SetWoOverwriteON procedure, changing the option to `VIEW_W_OVERWRITE` (with overwrite).
SetWoOverwriteON	Enables the `VIEW_WO_OVERWRITE` history option that was disabled by the SetWoOverwriteOFF procedure.
BeginDDL	Starts a DDL (data definition language) session for a specified table.
CommitDDL	Commits DDL changes made during a DDL session for a specified table, and ends the DDL session.
RollbackDDL	Rolls back (cancels) DDL changes made during a DDL session for a specified table, and ends the DDL session.
RecoverAllMigratingTables	Attempts to complete the migration process on a table that was left in an inconsistent state after the Workspace Manager migration procedure failed.
RecoverAllMigratingTables	Attempts to complete the migration process on all tables that were left in an inconsistent state after the Workspace Manager migration procedure failed.
CopyForUpdate	Allows LOB columns (BLOB, CLOB, or NCLOB) in version-enabled tables to be modified.
Export	Exports data from a version-enabled table (all rows, or as limited by any combination of several parameters) to a staging table.
Import	Imports data from a staging table (all rows, or as limited by any combination of several parameters) into a version-enabled table in a specified workspace.

1.16.2 Workspace Management Subprograms

Workspace management subprograms perform operations on workspaces.

Table 1–8 shows the subprograms available for workspace management.

Table 1–8 Workspace Management Subprograms

Procedure	Description
CreateWorkspace	Creates a new workspace in the database.
GotoWorkspace	Moves the current session to the specified workspace.
SetDiffVersions	Finds differences in values in version-enabled tables for two savepoints and their common ancestor (base). It creates rows in the differences views describing these differences.
GetDiffVersions	Returns the names of the (workspace, savepoint) pairs on which the session has performed the SetDiffVersions operation.
MergeTable	Applies changes to a table (all rows or as specified in the `WHERE` clause) in a workspace to its parent workspace.
MergeWorkspace	Applies all changes in a workspace to its parent workspace, and optionally removes the workspace.

Table 1–8 (Cont.) Workspace Management Subprograms

Procedure	Description
RollbackWorkspace	Discards all data changes made in the workspace to version-enabled tables.
RollbackTable	Discards all changes made in the workspace to a specified table (all rows or as specified in the `WHERE` clause).
RollbackToSP	Discards all data changes made in the workspace to version-enabled tables since the specified savepoint.
RefreshTable	Applies to a workspace all changes made to a table (all rows or as specified in the `WHERE` clause) in its parent workspace.
RefreshWorkspace	Applies to a workspace all changes made in its parent workspace.
AlterWorkspace	Modifies the description of a workspace.
ChangeWorkspaceType	Changes a workspace that is not continually refreshed to be continually refreshed.
RemoveWorkspace	Discards all row versions associated with a workspace and deletes the workspace.
RemoveWorkspaceTree	Discards all row versions associated with a workspace and its descendant workspaces, and deletes the affected workspaces.
FreezeWorkspace	Restricts access to a workspace and the ability of users to make changes in the workspace.
UnfreezeWorkspace	Enables access and changes to a workspace, reversing the effect of the FreezeWorkspace procedure.
CompressWorkspace	Deletes removable savepoints in a workspace, and minimizes the Workspace Manager metadata structures for the workspace.
CompressWorkspaceTree	Deletes removable savepoints in a workspace and all its descendant workspaces. It also minimizes the Workspace Manager metadata structures for the affected workspaces, and eliminates any redundant data that might arise from the deletion of the savepoints.
IsWorkspaceOccupied	Checks whether or not a workspace has any active sessions.
CreateSavepoint	Returns the current workspace for the session.
SetMultiWorkspaces	Makes the specified workspace or workspaces visible in the multiworkspace views for version-enabled tables.
GetMultiWorkspaces	Returns the names of workspaces visible in the multiworkspace views for version-enabled tables.
GetOpContext	Returns the context of the current operation for the current session.
AddAsParentWorkspace	Adds a workspace as a parent workspace to a child workspace in a multiparent workspace environment.
RemoveAsParentWorkspace	Removes a workspace as a parent workspace in a multiparent workspace environment.

1.16.3 Savepoint Management Subprograms

Savepoint management subprograms perform operations related to savepoints.

Table 1–9 shows the subprograms available for savepoint management.

Table 1–9 Savepoint Management Subprograms

Procedure	Description
CreateSavepoint	Creates a savepoint for the current version.
GotoSavepoint	Goes to the specified savepoint in the current workspace.
GotoDate	Goes to a point at or near the specified date and time in the current workspace.
GetSessionInfo	Retrieves information about the current workspace and session context; useful for finding the session's current savepoint or instant in time.
AlterSavepoint	Modifies the description of a savepoint.
DeleteSavepoint	Deletes a savepoint and associated rows in version-enabled tables.

1.16.4 Privilege Management Subprograms

Privilege management subprograms grant and revoke Workspace Manager privileges.

Table 1–10 shows the subprograms available for privilege management.

Table 1–10 Privilege Management Subprograms

Procedure	Description
GrantWorkspacePriv	Grants workspace-level privileges to users, roles, or `PUBLIC`.
RevokeWorkspacePriv	Revokes workspace-level privileges from users and roles.
GrantSystemPriv	Grants privileges on all workspaces to users, roles, or `PUBLIC`.
RevokeSystemPriv	Revokes system-level privileges from users and roles.
GetPrivs	Returns a comma-delimited list of all privileges that the current user has for the specified workspace.

1.16.5 Lock Management Subprograms

Lock management subprograms control Workspace Manager locking.

Table 1–11 shows the subprograms available for lock management.

Table 1–11 Lock Management Subprograms

Procedure	Description
SetLockingON	Enables Workspace Manager locking for the current session.
SetLockingOFF	Disables Workspace Manager locking for the current session.
SetWorkspaceLockModeON	Enables Workspace Manager locking for the specified workspace.
SetWorkspaceLockModeOFF	Disables Workspace Manager locking for the specified workspace.
GetLockMode	Returns the locking mode for the current session, which determines whether or not access is enabled to versioned rows and corresponding rows in the previous version.
LockRows	Controls access to versioned rows in a specified table and to corresponding rows in the parent workspace.

Table 1–11 (Cont.) Lock Management Subprograms

Procedure	Description
UnlockRows	Enables access to versioned rows in a specified table and to corresponding rows in the parent workspace.

1.16.6 Conflict Management Subprograms

Conflict management subprograms detect and resolve conflicts between workspaces.

Table 1–12 shows the subprograms available for conflict management.

Table 1–12 Conflict Management Subprograms

Procedure	Description
SetConflictWorkspace	Determines whether or not conflicts exist between a workspace and its parent workspace.
GetConflictWorkspace	Returns the name of the workspace on which the session has performed the SetConflictWorkspace procedure.
BeginResolve	Starts a conflict resolution session.
ResolveConflicts	Resolves conflicts between workspaces.
CommitResolve	Ends a conflict resolution session and saves (makes permanent) any changes in the workspace since the BeginResolve procedure was executed.
RollbackResolve	Quits a conflict resolution session and discards all changes in the workspace since the BeginResolve procedure was executed.

1.16.7 Replication Support Subprograms

Replication support subprograms provide support for Oracle replication in a Workspace Manager environment. For information about using replication, see Appendix C.

Table 1–13 shows the subprograms available for replication support.

Table 1–13 Replication Support Subprograms

Procedure	Description
GenerateReplicationSupport	Creates necessary structures for multimaster replication of Workspace Manager objects, and starts the master activity for the newly created master group.
DropReplicationSupport	Deletes replication support objects that were created by the GenerateReplicationSupport procedure.
RelocateWriterSite	Makes one of the nonwriter sites the new writer site in a Workspace Manager replication environment. (The old writer site becomes one of the nonwriter sites.)
SynchronizeSite	Brings the local site (the old writer site) up to date in the Workspace Manager replication environment after the writer site was moved using the RelocateWriterSite procedure.

1.16.8 Bulk Load Support Subprograms

Bulk load support subprograms enable SQL*Loader to be used for bulk loading data into version-enabled tables, as explained in Section 1.7.

Table 1–14 shows the subprograms available for bulk loading support.

Table 1–14 Bulk Loading Support Subprograms

Procedure	Description
GetBulkLoadVersion	Returns a version number to be specified when you call the BeginBulkLoading procedure.
BeginBulkLoading	Starts the bulk loading process for a version-enabled table.
CommitBulkLoading	Ends the bulk loading process for a version-enabled table by committing the bulk load changes.
RollbackBulkLoading	Rolls back changes made to a version-enabled table during a bulk load operation.

1.17 Simplified Examples Using Workspace Manager

This section presents two simplified examples of using Workspace Manager to try out some scenarios and select one of them. Each example uses workspaces and one or more savepoints. One example (in Section 1.17.2) uses the `OE.WAREHOUSES` table in the Oracle sample schemas.

The examples refer to concepts that were explained in this chapter, and they use procedures documented in Chapter 4.

1.17.1 Example: Marketing Budget Options

In Example 1–3, a soft drink (cola) manufacturer has four products, each with a marketing manager and a marketing budget. Because of an exceptional opportunity for growth in the market for one product (`cola_b`), the company wants to do *what-if* analyses involving different managers and budget amounts.

Example 1–3 Marketing Budget Options

```
-----------------------------------------------------------------
-- INITIAL SET-UP
-----------------------------------------------------------------
-- Create the user for schema objects.
CREATE USER wm_developer IDENTIFIED BY password;

-- Grant regular privileges.
GRANT connect, resource to wm_developer;
GRANT create table to wm_developer;

-- Grant WM-specific privileges (with grant_option = YES).
EXECUTE DBMS_WM.GrantSystemPriv ('ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE,
 CREATE_ANY_WORKSPACE, REMOVE_ANY_WORKSPACE, ROLLBACK_ANY_WORKSPACE',
 'wm_developer', 'YES');

-------------------------------------------------------------------------
-- CREATE AND POPULATE DATA TABLE --
-------------------------------------------------------------------------
CONNECT wm_developer
-- Enter password when prompted.

-- Cleanup: remove B_focus_2 workspace if it exists from previous run.
EXECUTE DBMS_WM.RemoveWorkspace ('B_focus_2');

-- Create a table for the annual marketing budget for
-- several cola (soft drink) products.
-- Each row will contain budget data for a specific
```

```
-- product. Note: This table does not reflect recommended
-- database design. (For example, a manager ID should
-- be used, not a name.) It is deliberately oversimplified
-- for purposes of illustration.

CREATE TABLE cola_marketing_budget (
  product_id NUMBER PRIMARY KEY,
  product_name VARCHAR2(32),
  manager VARCHAR2(32),  -- Here a name, just for simplicity
  budget NUMBER  -- Budget in millions of dollars. Example: 3 = $3,000,000.
);

-- Version-enable the table. Specify hist option of VIEW_WO_OVERWRITE so that
-- the COLA_MARKETING_BUDGET_HIST view contains complete history information
-- about data changes.
EXECUTE DBMS_WM.EnableVersioning ('cola_marketing_budget', 'VIEW_WO_OVERWRITE');

INSERT INTO cola_marketing_budget VALUES(
  1,
  'cola_a',
  'Alvarez',
  2.0
);
INSERT INTO cola_marketing_budget VALUES(
  2,
  'cola_b',
  'Baker',
  1.5
);
INSERT INTO cola_marketing_budget VALUES(
  3,
  'cola_c',
  'Chen',
  1.5
);
INSERT INTO cola_marketing_budget VALUES(
  4,
  'cola_d',
  'Davis',
  3.5
);
COMMIT;

-- Relevant data values now in LIVE workspace:
-- 1, cola_a, Alvarez, 2.0
-- 2, cola_b, Baker, 1.5
-- 3, cola_c, Chen, 1.5
-- 4, cola_d, Davis, 3.5

-------------------------------------------------------------------------
-- CREATE WORKSPACES --
-------------------------------------------------------------------------
-- Create workspaces for the following scenario: a major marketing focus
-- for the cola_b product. Managers and budget amounts for each
-- product can change, but the total marketing budget cannot grow.
--
-- One scenario (B_focus_1) features a manager with more expensive
-- plans (which means more money taken from other products' budgets).
-- The other scenario (B_focus_2) features a manager with less expensive
-- plans (which means less money taken from other products' budgets).
```

```
--
-- Two workspaces (B_focus_1 and B_focus_2) are created as child workspaces
-- of the LIVE database workspace.

EXECUTE DBMS_WM.CreateWorkspace ('B_focus_1');
EXECUTE DBMS_WM.CreateWorkspace ('B_focus_2');

--------------------------------------------------------------------------
-- WORK IN FIRST WORKSPACE --
--------------------------------------------------------------------------
-- Enter the B_focus_1 workspace and change the cola_b manager to Beasley and
-- raise the cola_b budget amount by 1.5 to bring it to 3.0. Reduce all other
-- products' budget amounts by 0.5 to stay within the overall budget.

EXECUTE DBMS_WM.GotoWorkspace ('B_focus_1');
UPDATE cola_marketing_budget
  SET manager = 'Beasley' WHERE product_name = 'cola_b';
UPDATE cola_marketing_budget
  SET budget = 3 WHERE product_name = 'cola_b';
UPDATE cola_marketing_budget
  SET budget = 1.5 WHERE product_name = 'cola_a';
UPDATE cola_marketing_budget
  SET budget = 1 WHERE product_name = 'cola_c';
UPDATE cola_marketing_budget
  SET budget = 3 WHERE product_name = 'cola_d';
COMMIT;

-- Relevant data values now in B_focus_1 workspace::
-- 1, cola_a, Alvarez, 1.5
-- 2, cola_b, Beasley, 3.0
-- 3, cola_c, Chen, 1.0
-- 4, cola_d, Davis, 3.0

-- Freeze this workspace to prevent any changes until workspace is unfrozen.
-- However, first go to the LIVE workspace, because a workspace cannot be frozen
-- if any users (including you) are in it.
EXECUTE DBMS_WM.GotoWorkspace ('LIVE');
EXECUTE DBMS_WM.FreezeWorkspace ('B_focus_1');

--------------------------------------------------------------------------
-- CREATE ANOTHER SCENARIO IN SECOND WORKSPACE --
--------------------------------------------------------------------------
-- Enter the B_focus_2 workspace and change the cola_b manager to Burton and
-- raise the cola_b budget amount by 0.5 to bring it to 2.0. Reduce only the
-- cola_d amount by 0.5 to stay within the overall budget.

EXECUTE DBMS_WM.GotoWorkspace ('B_focus_2');
UPDATE cola_marketing_budget
  SET manager = 'Burton' WHERE product_name = 'cola_b';
UPDATE cola_marketing_budget
  SET budget = 2 WHERE product_name = 'cola_b';
UPDATE cola_marketing_budget
  SET budget = 3 WHERE product_name = 'cola_d';
COMMIT;

-- Relevant data values now in B_focus_2 workspace::
-- 1, cola_a, Alvarez, 2.0 (no change from LIVE)
-- 2, cola_b, Burton, 2.0
-- 3, cola_c, Chen, 1.5 (no change from LIVE)
-- 4, cola_d, Davis, 3.0 (same manager, new budget)
```

```
-- Create a savepoint (B_focus_2_SP1), then change scenario to
-- raise cola_b budget and reduce cola_d budget by 0.5 each.

EXECUTE DBMS_WM.CreateSavepoint ('B_focus_2', 'B_focus_2_SP1');
UPDATE cola_marketing_budget
  SET budget = 2.5 WHERE product_name = 'cola_b';
UPDATE cola_marketing_budget
  SET budget = 2.5 WHERE product_name = 'cola_d';
COMMIT;

-- Relevant data values now in B_focus_2 workspace:
-- 1, cola_a, Alvarez, 2.0 (no change from LIVE)
-- 2, cola_b, Burton, 2.5
-- 3, cola_c, Chen, 1.5 (no change from LIVE)
-- 4, cola_d, Davis, 2.5 (same manager, new budget)

-- Discard this scenario; roll back to row values at the time savepoint
-- B_focus_2_SP1 was created. First, though, get out of the workspace
-- so it can be rolled back (no users in it).

EXECUTE DBMS_WM.GotoWorkspace ('LIVE');
EXECUTE DBMS_WM.RollbackToSP ('B_focus_2', 'B_focus_2_SP1');

-- Go back to the B_focus_2 workspace and display current values
-- (should include budget of 2 for cola_b and 3 for cola_d).
EXECUTE DBMS_WM.GotoWorkspace ('B_focus_2');
SELECT * FROM cola_marketing_budget;

-------------------------------------------------------------------------
-- SELECT SCENARIO AND UPDATE DATABASE --
-------------------------------------------------------------------------
-- Assume that you have decided to adopt the scenario of the second
-- workspace (B_focus_2) using that workspace's current values.

-- First go to the LIVE workspace, because a workspace cannot be removed
-- or merged if any users (including you) are in it.
EXECUTE DBMS_WM.GotoWorkspace ('LIVE');

-- Unfreeze the first workspace and remove it to discard any changes there.
EXECUTE DBMS_WM.UnfreezeWorkspace ('B_focus_1');
EXECUTE DBMS_WM.RemoveWorkspace ('B_focus_1');

-- Apply changes in the second workspace to the LIVE database workspace.
-- Note that the workspace is not removed by default after MergeWorkspace.
EXECUTE DBMS_WM.MergeWorkspace ('B_focus_2');

-- Display the current data values as seen by the LIVE workspace.
SELECT * FROM cola_marketing_budget;

-------------------------------------------------------------------------
-- DISABLE VERSIONING --
-------------------------------------------------------------------------
-- Disable versioning on the table because you are finished testing scenarios.
-- Set force parameter to TRUE if you want to force the disabling even
-- if changes were made in a non-LIVE workspace.

EXECUTE DBMS_WM.DisableVersioning ('cola_marketing_budget', TRUE);
```

1.17.2 Example: Warehouse Expansion Options

In Example 1–4, a company that uses the Oracle sample schemas decided that it needs additional warehouse space. It wants to consider two scenarios: a single large warehouse in Town A, and two smaller warehouses in Town B and Town C that together offer more total storage capacity. There are potential advantages and disadvantages to each scenario, and financial and legal issues to be resolved with each. Later, the company decides that it might need even more warehouse space under each scenario, so it wants to consider the same additional warehouse in each scenario.

Example 1–4 creates a workspace for each scenario; and within each workspace it creates a savepoint before adding an extra new warehouse to the table, because the company might decide not to use the extra warehouse. The warehouse rows are stored on the `OE.WAREHOUSES` table, which is part of the Oracle sample schemas.

Example 1–4 Warehouse Expansion Options

```
-----------------------------------------------------------------
-- INITIAL SET-UP
-----------------------------------------------------------------
-- Clean up from any previous running of this procedure.
DROP USER wm_developer CASCADE;

-- Create the user for schema objects.
CREATE USER wm_developer IDENTIFIED BY password;

-- Grant regular privileges.
GRANT connect, resource TO wm_developer;
GRANT create table TO wm_developer;

-- Grant privileges on tables to be modified.
GRANT select, insert, delete, update ON oe.warehouses TO wm_developer;
GRANT select, insert, delete, update ON hr.locations TO wm_developer;

-- Grant WM-specific privileges (with grant_option = YES).
EXECUTE DBMS_WM.GrantSystemPriv ('ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE,
 CREATE_ANY_WORKSPACE, REMOVE_ANY_WORKSPACE, ROLLBACK_ANY_WORKSPACE',
 'wm_developer', 'YES');

-- WM_ADMIN_ROLE required to version-enable a table in another schema.
GRANT wm_admin_role TO wm_developer;

-- Create rows for new locations, since a valid location ID is needed for each
-- proposed new warehouse.
INSERT INTO hr.locations VALUES
   (4000, '123 Any Street', '01234', 'Town A', 'MA', 'US');
INSERT INTO hr.locations VALUES
   (4100, '456 Some Street', '01235', 'Town B', 'MA', 'US');
INSERT INTO hr.locations VALUES
   (4200, '789 Other Street', '01236', 'Town C', 'MA', 'US');
INSERT INTO hr.locations VALUES
   (4300, '1 Yetanother Street', '01237', 'Town D', 'MA', 'US');

-------------------------------------------------------------------------
-- CREATE AND VERSION-ENABLE THE DATA TABLE --
-------------------------------------------------------------------------
CONNECT wm_developer
-- Enter password when prompted.
set echo on
set serveroutput on
```

```
-- Version-enable the OE.WAREHOUSES table. Specify hist option of
-- VIEW_WO_OVERWRITE so that the WAREHOUSES_HIST view contains
-- complete history information about data changes. However, because
-- OE.WAREHOUSES is the parent table in a referential integrity constraint
-- with OE.INVENTORIES, you must also version-enable that table.

EXECUTE DBMS_WM.EnableVersioning ('OE.WAREHOUSES, OE.INVENTORIES', hist => 'VIEW_
WO_OVERWRITE');

-------------------------------------------------------------------------
-- CREATE AND USE WORKSPACES --
-------------------------------------------------------------------------
-- The company has decided that it needs additional warehouse space.
-- It wants to consider two scenarios: a single large warehouse in Town A,
-- and two smaller warehouses in Town B and Town C that together offer more
-- total storage capacity. There are potential advantages and disadvantages
-- to each scenario, and financial and legal issues to be resolved with each.
--
-- Later, the company decides that it might need even more warehouse
-- space under each scenario, so it wants to consider the same additional
-- warehouse in each scenario.

-- Create a workspace for each scenario, with both created as child
-- workspaces of the LIVE database workspace.
-- In workspace large_warehouse, add one row for the single large warehouse.
-- In workspace smaller_warehouses, add two rows, one for each warehouse.
--
-- Also, within each workspace create a savepoint before adding the
-- extra warehouse, because the company might decide it does not
-- need the warehouse.

EXECUTE DBMS_WM.CreateWorkspace (workspace => 'large_warehouse');
EXECUTE DBMS_WM.CreateWorkspace (workspace => 'smaller_warehouses');

-- Set up the first scenario: Go to the large_warehouse workspace and first add
-- one row for a warehouse.

EXECUTE DBMS_WM.GotoWorkspace (workspace => 'large_warehouse');

INSERT INTO oe.warehouses VALUES (10, NULL, 'Town A', 4000,
  SDO_GEOMETRY(2001, 8307,
  SDO_POINT_TYPE(-71.00703, 42.27099, NULL), NULL, NULL));

UPDATE oe.warehouses SET warehouse_spec = sys.xmltype.createxml(
'<?xml version="1.0"?>
<Warehouse>
<Building>Owned</Building>
<Area>100000</Area>
<Docks>2</Docks>
<DockType>Side load</DockType>
<WaterAccess>Y</WaterAccess>
<RailAccess>Y</RailAccess>
<Parking>Lot</Parking>
<VClearance>15 ft</VClearance>
</Warehouse>'
) WHERE warehouse_id = 10;

COMMIT;
```

```
-- Create a savepoint so that you can, if necessary, roll back to the point
-- before the extra warehouse was added.
EXECUTE DBMS_WM.CreateSavepoint ('large_warehouse', 'large_warehouse_add_wh');

-- Add another warehouse for this scenario.
INSERT INTO oe.warehouses VALUES (11, NULL, 'Town D', 4300,
  SDO_GEOMETRY(2001, 8307,
  SDO_POINT_TYPE(-71.00707, 42.35226, NULL), NULL, NULL));

UPDATE oe.warehouses SET warehouse_spec = sys.xmltype.createxml(
'<?xml version="1.0"?>
<Warehouse>
<Building>Leased</Building>
<Area>55000</Area>
<Docks>1</Docks>
<DockType>Rear load</DockType>
<WaterAccess>N</WaterAccess>
<RailAccess>N</RailAccess>
<Parking>Street</Parking>
<VClearance>10 ft</VClearance>
</Warehouse>'
) WHERE warehouse_id = 11;

COMMIT;

-- Freeze this workspace to prevent any changes until the workspace is unfrozen.
-- However, first go to the LIVE workspace, because a workspace cannot be frozen
-- if any users (including you) are in it.
EXECUTE DBMS_WM.GotoWorkspace ('LIVE');
EXECUTE DBMS_WM.FreezeWorkspace ('large_warehouse');

-- Set up the second scenario: Go to the smaller_warehouses workspace and first
-- add two rows for the smaller warehouses.

EXECUTE DBMS_WM.GotoWorkspace ('smaller_warehouses');

INSERT INTO oe.warehouses VALUES (10, NULL, 'Town B', 4100,
  SDO_GEOMETRY(2001, 8307,
  SDO_POINT_TYPE(-71.02439, 42.28628, NULL), NULL, NULL));

INSERT INTO oe.warehouses VALUES (11, NULL, 'Town C', 4200,
  SDO_GEOMETRY(2001, 8307,
  SDO_POINT_TYPE(-70.97980, 42.37961, NULL), NULL, NULL));

UPDATE oe.warehouses SET warehouse_spec = sys.xmltype.createxml(
'<?xml version="1.0"?>
<Warehouse>
<Building>Owned</Building>
<Area>60000</Area>
<Docks>1</Docks>
<DockType>Side load</DockType>
<WaterAccess>Y</WaterAccess>
<RailAccess>Y</RailAccess>
<Parking>Lot</Parking>
<VClearance>15 ft</VClearance>
</Warehouse>'
) WHERE warehouse_id = 10;

UPDATE oe.warehouses SET warehouse_spec = sys.xmltype.createxml(
'<?xml version="1.0"?>
```

```
<Warehouse>
<Building>Leased</Building>
<Area>550000</Area>
<Docks>1</Docks>
<DockType>Rear load</DockType>
<WaterAccess>N</WaterAccess>
<RailAccess>Y</RailAccess>
<Parking>Street</Parking>
<VClearance>12 ft</VClearance>
</Warehouse>'
) WHERE warehouse_id = 11;

COMMIT;

-- Create a savepoint so that you can, if necessary, roll back to the point
-- before the extra warehouse was added.
EXECUTE DBMS_WM.CreateSavepoint ('smaller_warehouses', 'smaller_warehouses_add_
wh');

-- Add the extra warehouse for this scenario.
INSERT INTO oe.warehouses VALUES (12, NULL, 'Town D', 4300,
  SDO_GEOMETRY(2001, 8307,
  SDO_POINT_TYPE(-71.00707, 42.35226, NULL), NULL, NULL));

UPDATE oe.warehouses SET warehouse_spec = sys.xmltype.createxml(
'<?xml version="1.0"?>
<Warehouse>
<Building>Leased</Building>
<Area>55000</Area>
<Docks>1</Docks>
<DockType>Rear load</DockType>
<WaterAccess>N</WaterAccess>
<RailAccess>N</RailAccess>
<Parking>Street</Parking>
<VClearance>10 ft</VClearance>
</Warehouse>'
) WHERE warehouse_id = 12;

COMMIT;

-------------------------------------------------------------------------
-- SELECT A SCENARIO, AND APPLY IT --
-------------------------------------------------------------------------
-- Later, the company makes its decisions:
-- 1. Add two smaller warehouses.
-- 2. Do not add the extra warehouse (that is, no third new warehouse).
-- Consequently, you need to discard the first scenario (large_warehouse
-- workspace) completely, discard the warehouse addition in the second
-- scenario (roll back to smaller_warehouses_add_wh savepoint), and
-- apply the second scenario.

-- First go to the LIVE workspace, because a workspace cannot be removed
-- or merged if any users (including you) are in it.
EXECUTE DBMS_WM.GotoWorkspace ('LIVE');

-- Unfreeze the first workspace and remove it to discard any changes there.
EXECUTE DBMS_WM.UnfreezeWorkspace ('large_warehouse');
EXECUTE DBMS_WM.RemoveWorkspace ('large_warehouse');

-- Rollback the workspace for the second scenario to the savepoint created
```

```
-- before the extra warehouse was added.
EXECUTE DBMS_WM.RollbackToSP ('smaller_warehouses', 'smaller_warehouses_add_wh');

-- Apply changes in the smaller_warehouses workspace to the LIVE database
-- workspace; use the remove_workspace parameter to remove the
-- smaller_warehouses workspace after the merge.
EXECUTE DBMS_WM.MergeWorkspace ('smaller_warehouses', remove_workspace => TRUE);

-- The OE.WAREHOUSES table now has the desired data (two additional warehouses
-- from the smaller_warehouses scenario). Display the IDs and names just to be
-- sure.
SELECT warehouse_id, warehouse_name FROM oe.warehouses
   ORDER BY warehouse_id;

-- Disable versioning on the table because you are finished testing scenarios.
-- Set the force parameter to TRUE to force disabling even though changes
-- were made in a non-LIVE workspace. You must also version-disable
-- the other tables previously version-enabled (along with OE.WAREHOUSES).

EXECUTE DBMS_WM.DisableVersioning ('OE.WAREHOUSES, OE.INVENTORIES', force =>
TRUE);

-- Clean up by deleting the rows that were added to the OE.WAREHOUSES table.
DELETE FROM oe.warehouses WHERE warehouse_id >= 10;

-- Clean up by deleting the locations that were added.
DELETE FROM hr.locations WHERE location_id >= 4000;
```

The `SELECT` statement near the end of Example 1–4 displays the IDs and names of warehouses in the `OE.WAREHOUSES` table, including the newly added warehouses in Town B and Town C, as shown in the following example:

```
SELECT warehouse_id, warehouse_name FROM oe.warehouses
   ORDER BY warehouse_id;

WAREHOUSE_ID WAREHOUSE_NAME
------------ ----------------------------------
           1 Southlake, Texas
           2 San Francisco
           3 New Jersey
           4 Seattle, Washington
           5 Toronto
           6 Sydney
           7 Mexico City
           8 Beijing
           9 Bombay
          10 Town B
          11 Town C
```

2

Workspace Manager Events

Certain applications may be interested in knowing what Workspace Manager operations are being performed and may want to take some actions based on that. Several types of Workspace Manager operations can be captured as events. Workspace Manager provides a framework for communicating these events asynchronously to the interested applications. The applications can then take some actions based on the event. Some scenarios in which events can be used include the following:

- An application wants to be notified whenever a workspace is merged to LIVE so that it can refresh its data.
- Workspace data needs to be archived whenever a new savepoint is created.

The Workspace Manager event framework is built on the Oracle Advanced Queuing (AQ) capability. Messaging features provided by AQ, such as asynchronous notification, persistence, propagation, access control, history, and rule-based subscription, can be used for Workspace Manager events.

Workspace Manager creates a multiconsumer queue where events are enqueued. The relevant information about the event, such as the type of event, the user and workspace that triggered the event, and the name of the versioned table, is initialized in the event payload and enqueued. Applications can subscribe to these events, optionally specifying a rule for their subscriptions. Only the events that satisfy the rule will be applicable to the subscriber. Subscribers can get event notification in variety of ways, such as listening for the events in the queue, registering a callback for notification, or explicitly dequeuing events from the queue.

Because events are communicated asynchronously to the other applications, the performance of the workspace operation generating the event is not affected.

Note: To use Workspace Manager events in an application, you must understand the relevant AQ concepts and techniques described in *Oracle Streams Advanced Queuing User's Guide*.

This chapter contains the following major sections:

2.1 List of Workspace Manager Events

Table 2–1 lists the Workspace Manager events and when each occurs.

Table 2–1 Workspace Manager Events

Event	Occurs
TABLE_MERGE_W_REMOVE_DATA	When MergeTable is invoked with `remove_data` set to `TRUE`.
TABLE_MERGE_WO_REMOVE_DATA	When MergeTable is invoked with `remove_data` set to `FALSE`.
TABLE_REFRESH	When RefreshTable is invoked.
TABLE_ROLLBACK	When RollbackTable is invoked.
WORKSPACE_COMPRESS	When CompressWorkspace or CompressWorkspaceTree is invoked.
WORKSPACE_CREATE	When CreateWorkspace is invoked.
WORKSPACE_MERGE_W_REMOVE	When MergeWorkspace is invoked with `remove_workspace` set to `TRUE`.
WORKSPACE_MERGE_WO_REMOVE	When MergeWorkspace is invoked with `remove_workspace` set to `FALSE`.
WORKSPACE_REFRESH	When RefreshWorkspace is invoked.
WORKSPACE_REMOVE	When RemoveWorkspace or RemoveWorkspaceTree is invoked.
WORKSPACE_ROLLBACK	When RollbackWorkspace is invoked.
WORKSPACE_VERSION	When a new version is created in the workspace as a result of the creation of an explicit or implicit savepoint. (Savepoints are described in Section 1.1.2.)

2.2 Event Parameters

When an event occurs, information is stored in parameters that are bundled into an object type called `WMSYS.WM$EVENT_TYPE` and enqueued into the event queue. A subscriber can dequeue the event object on receiving notification. Table 2–2 describes the Workspace Manager event parameters.

Table 2–2 Workspace Manager Event Parameters

Event Parameter	Data Type	Description
event_name	`VARCHAR2(100)`	Name indicating the type of event.
workspace_name	`VARCHAR2(30)`	Workspace that caused the event to occur.
parent_workspace_name	`VARCHAR2(30)`	Parent workspace of the workspace that caused the event to occur.
user_name	`VARCHAR2(30)`	User that caused the event to occur.
table_name	`VARCHAR2(60)`	Version-enabled table on which the event occurred. If this parameter does not apply to an event, it is null.

Table 2–2 (Cont.) Workspace Manager Event Parameters

Event Parameter	Data Type	Description
aux_params	WMSYS.WM$NV_PAIR_NT_TYPE (which is table of WMSYS.WM$NV_PAIR_TYPE)	A nested table of (name,value) pairs that can contain additional information about the event. For TABLE_*xxx* events, it has one row containing the WHERE clause string used for the operation. For WORKSPACE_VERSION events, it has one row containing the savepoint name associated with the newly created version.

2.3 ALLOW_CAPTURE_EVENTS System Parameter

Before you can capture any Workspace Manager events, you must use the SetSystemParameter procedure to set the Workspace Manager system parameter ALLOW_CAPTURE_EVENTS to the value ON. This does not, however, cause any events to be captured; to capture events, you must use the SetCaptureEvent procedure.

You can later disallow the capture of Workspace Manager events by using the SetSystemParameter procedure to set ALLOW_CAPTURE_EVENTS to the value OFF, but you must first ensure that no events are currently being captured. Example 2–1 shows the sequence of procedure calls for enabling and disabling the capture of all events, and starting and stopping the capture all events.

Example 2–1 Capturing Workspace Manager Events

```
-- Allow Workspace Manager events to be captured. (Required for SetCaptureEvent)
EXECUTE DBMS_WM.SetSystemParameter ('ALLOW_CAPTURE_EVENTS', 'ON');
-- Start capturing all Workspace Manager events.
EXECUTE DBMS_WM.SetCaptureEvent ('ALL_EVENTS','ON');
   .
   .
   .
-- Stop capturing all Workspace Manager events.
EXECUTE DBMS_WM.SetCaptureEvent ('ALL_EVENTS','OFF');
-- Disallow capture of Workspace Manager events.
EXECUTE DBMS_WM.SetSystemParameter ('ALLOW_CAPTURE_EVENTS', 'OFF');
```

2.4 AQ Operations and Workspace Manager Events

This section describes Advanced Queuing objects and techniques relevant to developers of applications that work with captured Workspace Manager events.

2.4.1 Workspace Manager Event Queue Administration

Workspace Manager creates a multiconsumer queue named WMSYS.WM$EVENT_QUEUE based on a queue table named WMSYS.WM$EVENT_QUEUE_TABLE. The queue payload type is WMSYS.WM$EVENT_TYPE, which is an object type.

AQ creates some views for the queue that can be used for administrative purposes. Table 2–3 describes the views of interest to developers of Workspace Manager applications.

Table 2–3 AQ Administrative Views for Workspace Manager

View Name	Description
WMSYS.AQWMEVENT_QUEUE_TABLE	Describes the queue table in which events are stored. This view can be used for querying the events. The roles AQ_ADMINISTRATOR_ROLE and WM_ADMIN_ROLE are granted select privileges on this view.
WMSYS.AQWMEVENT_QUEUE_TABLE_S	Displays all the subscribers for the event queue; also displays the transformation for the subscriber if it was created with one. The roles AQ_ADMINISTRATOR_ROLE and WM_ADMIN_ROLE are granted select privileges on this view.
WMSYS.AQWMEVENT_QUEUE_TABLE_R	Displays only the rule-based subscribers for all queues in a given queue table, as well as the text of the rule defined by each subscriber. Also displays the transformation for the subscriber if one was specified. The roles AQ_ADMINISTRATOR_ROLE and WM_ADMIN_ROLE are granted select privileges on this view.

2.4.2 Privileges and Access Control for Queues

The database administrator has several options for granting privileges and access to queues. Some possible scenarios include:

- Grant the system privileges ENQUEUE ANY QUEUE and DEQUEUE ANY QUEUE directly to a database user by using the DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE procedure, and optionally later revoke privileges by using the DBMS_AQADM.REVOKE_SYSTEM_PRIVILEGE procedure.
- Grant the queue privileges ENQUEUE and DEQUEUE to the event queue WMSYS.WM$EVENT_QUEUE to a database user by using the DBMS_AQADM.GRANT_QUEUE_PRIVILEGE procedure, and optionally later revoke privileges by using the DBMS_AQADM.REVOKE_QUEUE_PRIVILEGE procedure.
- Grant the role AQ_ADMINISTRATOR_ROLE to a database user to give that user administrative privileges on any queue.

Example 2–2 shows privileges being granted for a user to subscribe to the event queue and dequeue events.

Example 2–2 Granting Privileges for Queue Access

```
-- Do the following while connected as SYSDBA.
-- These privileges are required for the user to execute AQ packages.
grant execute on DBMS_AQ to SCOTT ;
grant execute on DBMS_AQADM to SCOTT ;

-- Grant privilege to SCOTT for subscribing to the event queue.
exec DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE('MANAGE_ANY','SCOTT') ;

-- Grant privilege to SCOTT to dequeue events. (As an alternative, you could use
-- DBMS_AQADM.GRANT_QUEUE_PRIVILEGE to grant the DEQUEUE privilege on
-- WMSYS.WM$EVENT_QUEUE.)
exec DBMS_AQADM.GRANT_SYSTEM_PRIVILEGE('DEQUEUE_ANY','SCOTT') ;
```

2.4.3 Rule-Based Subscription

An event can be delivered to multiple recipients based on event parameters. You can define a rule-based subscription for the event queue as the mechanism for specifying interest in receiving events. Subscriber rules are then used to evaluate recipients for event delivery. A null rule indicates that the subscriber wishes to receive all events.

Example 2–3 creates a rule-based subscription for user SCOTT to deliver WORKSPACE_MERGE_WO_REMOVE events when the parent workspace is the LIVE workspace.

Example 2–3 Rule-Based Subscription for Workspace Manager Events

```
rem ================================================
rem Create queue subscribers
rem Register for MergeWorkspace event when
rem a workspace is merged to LIVE
rem ================================================

connect scott
-- Enter password when prompted.

DECLARE
    subscriber sys.aq$_agent;
BEGIN
    subscriber := sys.aq$_agent('MERGE_LISTENER', NULL, NULL);
    dbms_aqadm.add_subscriber(
      queue_name => 'WMSYS.WM$EVENT_QUEUE',
      subscriber => subscriber,
      rule => 'tab.user_data.event_name = ''WORKSPACE_MERGE_WO_REMOVE''
               and tab.user_data.parent_workspace_name = ''LIVE''');
END;
/
```

2.4.4 Listening for Events

The listen call is a blocking call that can be used to wait for events on a queue or a list of subscriptions. If the listen returns successfully, a dequeue must be used to retrieve the event.

Example 2–4 listens for events on an event queue.

Example 2–4 Listening for a Workspace Manager Event

```
rem ============================================================
rem The following example shows how an application can listen for
rem an event. Explicit dequeue must be performed to get the actual
rem event parameters. The user SCOTT must have sufficient privileges
rem as described in the "Access Control" section.
rem ============================================================

connect scott
-- Enter password when prompted.

set serveroutput on

DECLARE
 qlist dbms_aq.aq$_agent_list_t;
 agent_w_msg sys.aq$_agent;
 listen_timeout exception;
 pragma exception_init(listen_timeout, -25254);
BEGIN
 qlist(0) := sys.aq$_agent('MERGE_LISTENER', 'WMSYS.WM$EVENT_QUEUE', NULL);

 dbms_output.put_line ('Listening on event queue.');

 BEGIN
```

```
 DBMS_AQ.LISTEN(
         agent_list => qlist,
         wait => 30,
         agent =>  agent_w_msg);

         dbms_output.put_line(agent_w_msg.name) ;

         /* The event can be dequeued here to get the event data */

 EXCEPTION
        when listen_timeout THEN
                null;
 END;

END;
/
```

2.4.5 Asynchronous Notification

Asynchronous notification allows clients to receive notification of an event of interest. The client can use it to monitor multiple subscriptions. The client does not have to be connected to the database to receive notifications regarding its subscriptions.

If an application registers for asynchronous notification of Workspace Manager events using callbacks, the minimum values for the following `init.ora` parameters should be:

- `aq_tm_processes` = 1
- `job_queue_processes` = 2

Example 2–5 registers for a callback to receive asynchronous notification of events.

Example 2–5 Receiving Asynchronous Notification of Events

```
rem =====================================================
rem Example of how to register for a callback to the event
rem queue on behalf of a subscriber. Subscriber has already
rem been defined in previous section. The callback is
rem invoked by the AQ framework whenever an event satisfying the
rem rule for the subscriber occurs. The minimum values for
rem the following init.ora parameters should be set as follows.
rem   aq_tm_processes = 1
rem   job_queue_processes = 2
rem The user SCOTT must have sufficient privileges.
rem =============================================================

CONNECT scott
-- Enter password when prompted.

CREATE TABLE merge_log
(
  event_name      varchar2(30),
  workspace_name  varchar2(30),
  parent_workspace_name varchar2(30),
  user_name       varchar2(30)
);

CREATE OR REPLACE PROCEDURE scott.event_callback(
   context RAW , reginfo sys.aq$_reg_info, descr sys.aq$_descriptor,
```

```
   payload VARCHAR2,  payloadl NUMBER)
AS
    deq_msgid           RAW(16);
    dopt                dbms_aq.dequeue_options_t;
    mprop               dbms_aq.message_properties_t;
    event               WMSYS.WM$EVENT_TYPE;
    no_messages         exception;
    pragma exception_init(no_messages, -25228);

BEGIN
    dopt.consumer_name := 'MERGE_LISTENER';
    dopt.wait := 30;
    dopt.msgid := descr.msg_id;

    dbms_aq.dequeue(
        queue_name => 'WMSYS.WM$EVENT_QUEUE',
        dequeue_options => dopt,
        message_properties => mprop,
        payload => event,
        msgid => deq_msgid);

    INSERT INTO merge_log VALUES (event.event_name, event.workspace_name,
      event.parent_workspace_name, event.user_name);

    /* Note: If there are additional parameters stored in
       "aux_params" attribute, it can be accessed using
       event.aux_params(1).name, event.aux_params(1).value,
       event.aux_params(2).name … and so on. The number of
       parameters can be accessed using event.aux_params.count
       when aux_params is not null.
     */
END;
/

grant execute on scott.event_callback to public ;

rem ================================================
rem Register a callback for the event
rem Queue name and subscriber name have to be specified
rem while registering for a callback
rem ================================================

DECLARE
  reginfo1            sys.aq$_reg_info;
  reginfolist         sys.aq$_reg_info_list;
BEGIN
  reginfo1 := sys.aq$_reg_info('WMSYS.WM$EVENT_QUEUE:MERGE_
LISTENER',1,'plsql://scott.event_callback?PR=1',HEXTORAW('FF'));

  reginfolist := sys.aq$_reg_info_list(reginfo1);

  sys.dbms_aq.register(reginfolist, 1);

  COMMIT;

END;
/
```

3

Workspace Manager Valid Time Support

This chapter describes the support for valid time, also known as effective dating, with version-enabled tables. It contains the following major sections:

3.1 Valid Time Support: Introduction and Example

Some applications need to store data with an associated time range that indicates the validity of the data. That is, each record is valid only within the time range associated with the record.

You can enable valid time support when you version-enable a table. (You can also add valid time support to an existing version-enabled table, as explained in Section 3.10.) If you enable valid time support, each row contains an added column to hold the valid time period associated with the row. You can specify a valid time range for the session, and Workspace Manager will ensure that queries and insert, update, and delete operations correctly reflect and accommodate the valid time range. The valid time range specified can be in the past or the future, or it can include the past, present, and future.

Example 3–1 presents a simple example of valid time support. The example does the following:

1. Creates a table of employees and their salaries.
2. Version-enables the table, specifying valid time support, which causes a column named `WM_VALID` to be added to the table automatically.
3. Inserts rows into the table. For each row, it specifies the employee name, salary, and valid time period.

4. Sets the valid time range for the session.
5. Updates a row, specifying a new salary and valid time period for an employee.
6. Disables versioning on the table.

Example 3–1:

- Refers to valid time support concepts and techniques that will be explained in other sections of this chapter.
- Assumes that you are familiar with the Workspace Manager concepts and techniques explained in Chapter 1.
- Does not create workspaces or savepoints. (These are shown in Example 1–3 and Example 1–4 in Section 1.17.)

Example 3–1 Valid Time Support

```
-- Create a very simple employees table (deliberately oversimplified
-- for purposes of illustration).
CREATE TABLE employees (
  name VARCHAR2(16) PRIMARY KEY,
  salary NUMBER
);

-- Version-enable the table. Specify TRUE for valid time support.
EXECUTE DBMS_WM.EnableVersioning ('employees', 'VIEW_WO_OVERWRITE', FALSE, TRUE);

INSERT INTO employees VALUES(
  'Adams',
  30000,
  WMSYS.WM_PERIOD(TO_DATE('01-01-1990', 'MM-DD-YYYY'),
                  TO_DATE('01-01-2005', 'MM-DD-YYYY'))
);
INSERT INTO employees VALUES(
  'Baxter',
  40000,
  WMSYS.WM_PERIOD(TO_DATE('01-01-2000', 'MM-DD-YYYY'), DBMS_WM.UNTIL_CHANGED)
);

INSERT INTO employees VALUES(
  'Coleman',
  50000,
  WMSYS.WM_PERIOD(TO_DATE('01-01-2003', 'MM-DD-YYYY'),
                  TO_DATE('12-31-9999', 'MM-DD-YYYY'))
);

COMMIT;

-- Set valid time period to virtually all time.
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-1900', 'MM-DD-YYYY'),
  TO_DATE('01-01-9999', 'MM-DD-YYYY'));

-- Update the salary for an existing employee. Perform "sequenced" update, so
-- that existing time-related information is preserved. This results in two rows
-- for Baxter.
-- First, set valid time to the intended range for Baxter's raise.
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-2003', 'MM-DD-YYYY'), DBMS_WM.UNTIL_
CHANGED);
-- Give Baxter a raise, effective 01-Jan-2003 until changed.
UPDATE employees SET salary = 45000 WHERE name = 'Baxter';
```

```
-- Disable versioning. By default (keepWMValid parameter value of TRUE),
-- the WM_VALID column is kept, with all its data.
COMMIT;
EXECUTE DBMS_WM.DisableVersioning ('employees');
```

3.2 WM_PERIOD Data Type

The WM_PERIOD data type is used to specify a valid time range for the session or workspace, and for a row in a version-enabled table. The WM_PERIOD type is defined as follows:

```
CREATE TYPE WM_PERIOD AS OBJECT  (
  validFrom  TIMESTAMP WITH TIME ZONE,
  validTill  TIMESTAMP WITH TIME ZONE);
```

The validFrom date is inclusive, and the validTill period is exclusive; that is, the valid date range starts on the validFrom date and extends up to but not including the validTill date.

Example 3–2 sets the session valid time range to 01-Jan-2003.

Example 3–2 Setting the Session Valid Time to a Specific Date

```
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-2003', 'MM-DD-YYYY'), TO_
DATE('01-02-2003', 'MM-DD-YYYY'));
```

Example 3–3 inserts a row that is valid from 01-Jan-2003 until it is changed.

Example 3–3 Inserting a Row Valid for a Time Range

```
INSERT INTO employees VALUES(
  'Baxter',
  40000,
  WMSYS.WM_PERIOD(TO_DATE('01-01-2003', 'MM-DD-YYYY'), DBMS_WM.UNTIL_CHANGED)
);
```

If you want the valid time range to be stored, in views created on tables with valid time support, using two columns of type TIMEZONE WITH TIMESTAMP instead of a single column of type WM_VALID, you can set the Workspace Manager system parameter USE_SCALAR_TYPES_FOR_VALIDTIME to ON, as explained in Section 1.5.

3.3 Valid Time Constants

Table 3–1 lists constants that can be used in the validFrom and validTill timestamps of a WM_PERIOD specification. (Workspace Manager uses these as constants, but they are implemented as functions.)

Table 3–1 Constants for Valid Time Support

Constant	Explanation
DBMS_WM.MIN_TIME	The minimum (earliest) timestamp value supported by Workspace Manager. Currently the beginning of the day on 01-Jan in the year -4712 (4712 BCE).
DBMS_WM.MAX_TIME	The maximum (latest) timestamp value supported by Workspace Manager. Currently the end of the day (11:59.999999000 pm) on 31-Dec-9999.

Table 3–1 (Cont.) Constants for Valid Time Support

Constant	Explanation
DBMS_WM.UNTIL_CHANGED	A timestamp that is treated as DBMS_WM.MAX_TIME until a subsequent modification overrides the value.

3.4 API Features for Valid Time Support

Table 3–2 lists DBMS_WM subprograms that are devoted to valid time support or that have parameters related to valid time support.

Table 3–2 API Features for Valid Time Support

Subprogram	Valid Time Support
EnableVersioning	If the `validTime` parameter value is TRUE, the table is version-enabled `with` valid time support. A column named `WM_VALID` of type WM_PERIOD is added to the table. For any existing rows, the `WM_VALID` column is set with a `validFrom` timestamp of SYSTIMESTAMP and a `validTill` timestamp of DBMS_WM.UNTIL_CHANGED.
DisableVersioning	The `keepWMValid` parameter determines whether to keep (the default) or delete the `WM_VALID` column and its data when the table is version-disabled.
GetValidFrom	Returns the `validFrom` timestamp from the session valid time period.
GetValidTill	Returns the `validTill` timestamp from the session valid time period.
SetValidTime	Sets the session valid time period to the specified range. You can execute the procedure with no parameters (to have the valid time range set as from the current time and until changed), with only the `validFrom` parameter, or with both the `validFrom` and `validTill` parameters.
SetValidTimeFilterOFF	Removes the valid time filter for the current session.
SetValidTimeFilterON	Sets a valid time filter for the current session (that is, a time to be applied to version-enabled tables.
SetWMValidUpdateModeOFF	Disables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support.
SetWMValidUpdateModeON	Enables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support.

3.5 Operators for Valid Time Support

Workspace Manager provides relationship checking operators and set operators that accept two time period parameters and that can be used to apply valid time filters in a query.

The relationship checking operators return the integer value 1 if the relationship between the two periods exists, and 0 if the relationship does not exist. The following relationship checking operators for are provided for valid time support:

- WM_OVERLAPS checks if two periods overlap.
- WM_CONTAINS checks if the first period contains the second period.
- WM_MEETS checks if the end of the first period is the start of the second period.

- WM_EQUALS checks if the two periods are equal (that is, their start and end times are the same).
- WM_LESSTHAN checks if the end of the first period is less than (that is, earlier than) the start of the second period.
- WM_GREATERTHAN checks if the start of the first period is greater than (that is, later than) the end of the second period.

The set operators return the period reflecting the relationship between the two periods, or a null value if the two periods do not have the specified relationship. The following set operators for are provided for valid time support:

- WM_INTERSECTION returns the intersection of the two periods, that is, the time range common to both periods.
- WM_LDIFF returns the difference between the two periods on the left (that is, earlier in time).
- WM_RDIFF returns the difference between the two periods on the right (that is, later in time).

You can use the relationship checking operators as alternatives to using the wm_valid.validFrom and wm_valid.validTill attributes of the row. For example, the following two queries, which select data valid on 01-Jan-1991, are equivalent:

```
SELECT * FROM employees e WHERE WM_CONTAINS (e.wm_valid,
   WMSYS.WM_PERIOD(TO_DATE('01-01-1991', 'MM-DD-YYYY'),
                   TO_DATE('01-02-1991', 'MM-DD-YYYY')) = 1;
SELECT * from employees e
   WHERE e.wm_valid.validFrom <= TO_DATE('01-01-1991', 'MM-DD-YYYY')
     AND e.wm_valid.validTill > TO_DATE('01-03-1991', 'MM-DD-YYYY');
```

The rest of this section contains additional information about each operator. The operators are listed in alphabetical order.

3.5.1 WM_CONTAINS

The WM_CONTAINS operator checks if the first period contains the second period. `WM_CONTAINS(p1, p2)` returns `1` only if the period `p1` contains the period `p2`; otherwise, it returns `0`.

For example:

```
WM_CONTAINS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1988', 'MM-DD-YYYY'))) = 1

WM_CONTAINS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY'))) = 0
```

Example 3–4 returns all rows in the `EMPLOYEES` table that were valid on 01-Jan-1995 (that is, where the `WM_VALID` column value contains the period for 01-Jan-1995).

Example 3–4 WM_CONTAINS Operator

```
SELECT * FROM employees e
  WHERE WM_CONTAINS(e.wm_valid,
    wm_period(TO_DATE('01-01-1995', 'MM-DD-YYYY'),
              TO_DATE('01-02-1995', 'MM-DD-YYYY'))) = 1;

NAME                SALARY
--------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Adams                30000
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')
```

3.5.2 WM_EQUALS

The WM_EQUALS operator checks if the first period is equal to (that is, the same as) the second period. `WM_CONTAINS(p1, p2)` returns `1` only if the period `p1` is equal to the period `p2`; otherwise, it returns `0`.

For example:

```
WM_EQUALS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY'))) = 1

WM_EQUALS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY'))) = 0
```

Example 3–5 returns all rows in the `EMPLOYEES` table that are valid from 01-Jan-1990 until 01-Jan-2005 (that is, where the `WM_VALID` column value is equal to that period).

Example 3–5 WM_EQUALS Operator

```
SELECT * FROM employees e
  WHERE WM_EQUALS(e.wm_valid,
    wm_period(TO_DATE('01-01-1990', 'MM-DD-YYYY'),
              TO_DATE('01-01-2005', 'MM-DD-YYYY'))) = 1;

NAME                SALARY
--------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Adams                30000
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')
```

3.5.3 WM_GREATERTHAN

The WM_GREATERTHAN operator checks if the first period is greater than (that is, occurs after) the second period. `WM_CONTAINS(p1, p2)` returns `1` only if the entire period `p1` is later than the period `p2`; otherwise, it returns `0`.

For example:

```
WM_GREATERTHAN(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1970', 'MM-DD-YYYY'),
      TO_DATE('01-01-1980', 'MM-DD-YYYY'))) = 1

WM_GREATERTHAN(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1970', 'MM-DD-YYYY'),
      TO_DATE('01-01-1981', 'MM-DD-YYYY'))) = 0
```

Example 3–6 returns all rows in the `EMPLOYEES` table that are valid only after 01-Jan-2001 (that is, where the `WM_VALID` column timestamps are both after 01-Jan-2001).

Example 3–6 WM_GREATERTHAN Operator

```
SELECT * FROM employees e
  WHERE WM_GREATERTHAN(e.wm_valid,
    wm_period(TO_DATE('01-01-2001', 'MM-DD-YYYY'),
              TO_DATE('01-02-2001', 'MM-DD-YYYY'))) = 1;

NAME                 SALARY
---------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Coleman               50000
WM_PERIOD('01-JAN-2003 12:00:00 -04:00', '31-DEC-9999 12:00:00 -04:00')
```

3.5.4 WM_INTERSECTION

The WM_INTERSECTION operator returns the intersection of the two periods, that is, the period common to both specified periods. `WM_INTERSECTION(p1, p2)` returns a period that is the intersection of periods `p1` and `p2`.

The following example returns the period between 01-Jan-1985 to 01-Jan-1988:

```
WM_INTERSECTION(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1988', 'MM-DD-YYYY')))
```

The following example returns the period between 01-Jan-1985 to 01-Jan-1990:

```
WM_INTERSECTION(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY')))
```

The following example returns a null value, because there is no intersection of the periods:

```
WM_INTERSECTION(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1992', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY')))
```

Example 3–7 returns, for each row in the `EMPLOYEES` table, the employee name and the period in which the `WM_PERIOD` column value intersects the period on 01-Jan-1995.

Example 3–7 WM_INTERSECTION Operator

```
SELECT e.name, WM_INTERSECTION(e.wm_valid,
  wm_period(TO_DATE('01-01-1995', 'MM-DD-YYYY'),
            TO_DATE('01-02-1995', 'MM-DD-YYYY')))
 FROM employees e;

NAME
----------------
WM_INTERSECTION(E.WM_VALID,WM_PERIOD(TO_DATE('01-01-1995','MM-DD-
--------------------------------------------------------------------------------
Adams
WM_PERIOD('01-JAN-1995 12:00:00 -04:00', '02-JAN-1995 12:00:00 -04:00')

Baxter


Coleman
```

As you can see in the output of Example 3–7, only Adams has a row that is valid on 01-Jan-1995.

3.5.5 WM_LDIFF

The WM_LDIFF operator returns the difference between the two periods on the left (that is, earlier in time). `WM_LDIFF(p1, p2)` returns a period that is the difference between periods `p1` and `p2` on the left.

The following example returns the period between 01-Jan-1980 to 01-Jan-1985:

```
WM_LDIFF(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1988', 'MM-DD-YYYY')))
```

The following example returns a null value because `p1.validFrom` is greater than `p2.validFrom`:

```
WM_LDIFF(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
```

```
   WM_PERIOD(
      TO_DATE('01-01-1975', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY')))
```

The following example returns a null value because `p2` is completely outside (in this case, later than) `p1`:

```
WM_LDIFF(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1992', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY')))
```

Example 3–8 returns, for each row in the `EMPLOYEES` table, the employee name and the period in which the `WM_PERIOD` column value is different on the left from 01-Jan-1995.

Example 3–8 WM_LDIFF Operator

```
SELECT e.name, WM_LDIFF(e.wm_valid,
  wm_period(TO_DATE('01-01-1995', 'MM-DD-YYYY'),
            TO_DATE('01-02-1995', 'MM-DD-YYYY')))
 FROM employees e;

NAME
----------------
WM_LDIFF(E.WM_VALID,WM_PERIOD(TO_DATE('01-01-1995','MM-DD-YYYY'),
--------------------------------------------------------------------------------
Adams
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-1995 12:00:00 -04:00')

Baxter


Coleman
```

As you can see in the output of Example 3–8, only Adams has a row that is valid during the period of difference on the left.

3.5.6 WM_LESSTHAN

The WM_LESSTHAN operator checks if the first period is less than (that is, occurs before) the second period. `WM_CONTAINS(p1, p2)` returns `1` only if the entire period `p1` is less than the period `p2`; otherwise, it returns `0`.

For example:

```
WM_LESSTHAN(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1991', 'MM-DD-YYYY'),
      TO_DATE('01-01-1992', 'MM-DD-YYYY'))) = 1

WM_LESSTHAN(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
```

```
   WM_PERIOD(
      TO_DATE('01-01-1989', 'MM-DD-YYYY'),
      TO_DATE('01-01-1992', 'MM-DD-YYYY'))) = 0
```

Example 3–9 returns all rows in the EMPLOYEES table that are valid only before 01-Jan-2010 (that is, where the WM_VALID column timestamps are both before 01-Jan-2001).

Example 3–9 WM_LESSTHAN Operator

```
SELECT * FROM employees e
  WHERE WM_LESSTHAN(e.wm_valid,
    wm_period(TO_DATE('01-01-2010', 'MM-DD-YYYY'),
              TO_DATE('01-02-2010', 'MM-DD-YYYY'))) = 1;

NAME                SALARY
--------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Adams                30000
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')
```

3.5.7 WM_MEETS

The WM_MEETS operator checks if the end of the first period is the start of the second period. `WM_MEETS(p1, p2)` returns `1` only if `p1.validTill = p2.validFrom`; otherwise, it returns `0`.

For example:

```
WM_MEETS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1990', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY'))) = 1

WM_MEETS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1992', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY'))) = 0
```

Example 3–10 returns all rows in the EMPLOYEES table that are valid only if the ending timestamp of the valid date period is the same as the start of the period from 01-Jan-2005 until 01-Jan-2006 (that is, if WM_VALID.validTill is equal to the start of the specified period).

Example 3–10 WM_MEETS Operator

```
SELECT * FROM employees e
  WHERE WM_MEETS(e.wm_valid,
    wm_period(TO_DATE('01-01-2005', 'MM-DD-YYYY'),
              TO_DATE('01-01-2006', 'MM-DD-YYYY'))) = 1;

NAME                SALARY
--------------- ----------
```

```
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Adams                 30000
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')
```

3.5.8 WM_OVERLAPS

The WM_OVERLAPS operator checks if two periods overlap. `WM_OVERLAPS(p1, p2)` returns `1` if the periods `p1` and `p2` overlap; otherwise, it returns `0`.

For example:

```
WM_OVERLAPS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY'))) = 1

WM_OVERLAPS(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1970', 'MM-DD-YYYY'),
      TO_DATE('01-01-1980', 'MM-DD-YYYY'))) = 0
```

Example 3–11 returns all rows in the `EMPLOYEES` table whose valid date range overlaps the period from 01-Jan-1990 until 01-Jan-2000.

Example 3–11 WM_OVERLAPS Operator

```
SELECT * FROM employees e
  WHERE WM_OVERLAPS(e.wm_valid,
    wm_period(TO_DATE('01-01-1990', 'MM-DD-YYYY'),
              TO_DATE('01-01-2000', 'MM-DD-YYYY'))) = 1;

NAME                 SALARY
---------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Adams                 30000
WM_PERIOD('01-JAN-1990 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')
```

3.5.9 WM_RDIFF

The WM_RDIFF operator returns the difference between the two periods on the right (that is, later in time). `WM_RDIFF(p1, p2)` returns a period that is the difference between periods `p1` and `p2` on the right.

The following example returns the period between 01-Jan-1988 to 01-Jan-1990:

```
WM_RDIFF(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1985', 'MM-DD-YYYY'),
      TO_DATE('01-01-1988', 'MM-DD-YYYY')))
```

The following example returns a null value because `p1.validTill` is less than `p2.validTill`:

```
WM_RDIFF(
   WM_PERIOD(
      TO_DATE('01-01-1980', 'MM-DD-YYYY'),
      TO_DATE('01-01-1990', 'MM-DD-YYYY')),
   WM_PERIOD(
      TO_DATE('01-01-1975', 'MM-DD-YYYY'),
      TO_DATE('01-01-1995', 'MM-DD-YYYY')))
```

Example 3–12 returns, for each row in the `EMPLOYEES` table, the employee name and the period in which the `WM_PERIOD` column value is different on the right from 01-Jan-1995.

Example 3–12 WM_RDIFF Operator

```
SELECT e.name, WM_RDIFF(e.wm_valid,
  wm_period(TO_DATE('01-01-1995', 'MM-DD-YYYY'),
            TO_DATE('01-02-1995', 'MM-DD-YYYY')))
 FROM employees e;

NAME
----------------
WM_RDIFF(E.WM_VALID,WM_PERIOD(TO_DATE('01-01-1995','MM-DD-YYYY'),
--------------------------------------------------------------------------------
Adams
WM_PERIOD('02-JAN-1995 12:00:00 -04:00', '01-JAN-2005 12:00:00 -04:00')

Baxter


Coleman
WM_PERIOD('01-JAN-2003 12:00:00 -04:00', '31-DEC-9999 12:00:00 -04:00')
```

As you can see in the output of Example 3–12, only Adams and Coleman have rows that are valid during the period of difference on the right.

3.6 Queries and DML Operations with Valid Time Support

This section describes some behaviors and considerations for queries and data manipulation language (insert, update, and delete) operations related to valid time support.

3.6.1 Queries

All queries issued against a version-enabled table with valid time support take into account the current session's valid time setting (set using the SetValidTime or SetValidTimeFilterON procedure). Unless the query specifies otherwise (for example, by using one of the valid time support operators described in Section 3.5), each query displays all rows from the underlying table having a valid time range that overlaps the session valid time or valid time filter, and that satisfy the other conditions of the query.

By default (that is, if the SetValidTime procedure has not been invoked in the session or if it was invoked with no parameters), all rows that are valid at the current time are considered valid, and the valid time period is considered to be from the current time forward without limit.

3.6.2 Data Manipulation (DML) Operations

All DML statements (INSERT, UPDATE, and DELETE) issued against a version-enabled table with valid time support take into account the current session's valid time setting and update mode. (The update mode is controlled by the SetWMValidUpdateModeON and SetWMValidUpdateModeOFF procedures.) The DML statements can affect all rows that are valid for the valid time period.

By default (that is, if the SetValidTime procedure has not been invoked in the session or if it was invoked with no parameters), all rows that are valid at the current time can be affected by DML statements, and all modified rows have their valid time range timestamps set as from the current time until changed.

The following sections describe additional considerations that apply to specific kinds of DML operations.

3.6.2.1 Update Operations

Update operations to version-enabled tables with valid time support can be sequenced or nonsequenced.

A **sequenced update** operation occurs when you do not specify a change to the `WM_VALID` column in the UPDATE statement. In a sequenced update operation, the `WM_VALID.ValidTill` value for the row is changed to the `ValidFrom` timestamp of the current session valid time range, and a new row is created in which the `WM_VALID` period reflects the current session valid time range. Sequenced updates ensure that no duplicate records are created by an UPDATE statement, because the `WM_VALID` column values are different.

Example 3–13 shows a sequenced update operation, in which employee Baxter is given a raise. Before the update, there is one row for Baxter, with a salary of 40000 and a valid time period from 01-Jan-2000 until changed.

Example 3–13 Sequenced Update Operation

```
-- Update the salary for an existing employee. Perform "sequenced" update, so
-- that existing time-related information is preserved. This results in two rows
-- for Baxter.
-- First, set valid time to the intended range for Baxter's raise.
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-2003', 'MM-DD-YYYY'),
  DBMS_WM.UNTIL_CHANGED);
-- Give Baxter a raise, effective 01-Jan-2003 until changed.
UPDATE employees SET salary = 45000 WHERE name = 'Baxter';
```

The update operation in Example 3–13 modifies the `WM_VALID` value of the existing row and creates a new row with the new salary value and the `WM_VALID` value reflecting the session valid time range, as shown by the following statements:

```
-- Set valid time to encompass virtually all time.
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-1900', 'MM-DD-YYYY'), TO_
DATE('01-02-9999', 'MM-DD-YYYY'));

-- See what data exists for Baxter.
SELECT * FROM employees WHERE name = 'Baxter';

NAME                SALARY
--------------- ----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
Baxter               45000
WM_PERIOD('01-JAN-2003 12:00:00 -04:00', NULL)
```

```
Baxter                40000
WM_PERIOD('01-JAN-2000 12:00:00 -04:00', '01-JAN-2003 12:00:00 -04:00')
```

A **sequenced delete** operation deletes the portion of a row that falls within the session valid time range; that is, a new row is created in which the `WM_VALID` period reflects the current session valid time range, and then that row is deleted. If the UPDATE statement in Example 3–13 had instead been `DELETE FROM employees WHERE name = 'Baxter';`, the new row for Baxter, valid from 01-Jan-2003 until changed, would have been deleted, but any rows for Baxter valid before 01-Jan-2003 would not be affected. There is no concept of a non-sequenced delete operation; for example, if a valid time was not set in Example 3–13, a delete operation `WHERE name = 'Baxter'` would delete all rows for Baxter.

Sequenced update and delete operations are enabled when a table is version-enabled with valid time support or when valid time support is added to a version-enabled table. However, you can disable support for sequenced update and delete operations (as well as for nonsequenced update operations) by using the SetWMValidUpdateModeOFF procedure, and you can re-enable support by using the SetWMValidUpdateModeON procedure. (Both procedures are described in Chapter 4.)

A **nonsequenced update** operation occurs when you specify a change to the `WM_VALID` column in the UPDATE statement. In a nonsequenced update operation, no additional row is created, and the `WM_VALID` column value of the updated row or rows reflects what you specified in the UPDATE statement. You must ensure that a nonsequenced update operation will not result in multiple rows with the same primary key value being valid in the period specified in the UPDATE statement; otherwise, the update fails because of a primary key constraint violation.

If the UPDATE statement in Example 3–13 had been a nonsequenced update operation, the result would have been only one row for Baxter: the existing row would have had the salary set to 45000 and the `WM_VALID` column set to the period specified in the UPDATE statement.

3.6.2.2 Insert Operations

When you insert a row into a version-enabled table with valid time support, you can specify a valid time period for the row. If you specify null timestamps for the period, the session valid time period is used.

When a row is inserted into a version-enabled table with valid time support, Workspace Manager checks to ensure that no existing rows with the same primary key value have a valid time range that overlaps the valid time range of the newly inserted row. If such a row is found, an exception is raised. Example 3–14 shows an attempted insert operation that violates a primary key constraint because overlapping valid time periods.

Example 3–14 Insert Operation Failing Because of Overlapping Time Periods

```
-- Insert. Should violate primary key constraint, because of overlapping times:
-- existing Coleman row is valid from 01-Jan-2003 until 31-Dec-9999.
INSERT INTO employees VALUES(
  'Coleman',
  55000,
  WMSYS.WM_PERIOD(TO_DATE('01-01-2004', 'MM-DD-YYYY'),
                  TO_DATE('12-31-9999', 'MM-DD-YYYY'))
);
)
*
```

```
ERROR at line 6:
ORA-20010: unique key violation
ORA-06512: at "WM_DEVELOPER.OVM_INSERT_10", line 1
ORA-04088: error during execution of trigger 'WM_DEVELOPER.OVM_INSERT_10'
```

To make the statement in Example 3–14 succeed, first change the WM_VALID.ValidTill attribute for the Coleman row to a timestamp reflecting 01-Jan-2004 or an earlier date.

3.7 Constraint Management for Valid Time Support

This section describes considerations related to valid time support that affect referential integrity constraints and unique constraints.

3.7.1 Referential Integrity Constraints

If a referential integrity constraint exists between two version-enabled tables that have valid time support, the valid time periods of rows are considered when the constraint is enforced. For example, assume that a DEPARTMENTS table has a MANAGER_ID column that is a foreign key referencing the EMPLOYEE_ID column in an EMPLOYEES table (that is, the department manager must be an existing employee). If both tables are version-enabled with valid time support, and if an insert or update operation would result in a new DEPARTMENTS.MANAGER_ID value, the operation will fail if the DEPARTMENTS.WM_VALID value is not within the range of the EMPLOYEES.WM_VALID value for the employee who is being made the department manager. (That is, the operation will fail if the new department manager is not a valid employee for the time period specified or defaulted for the insert or update operation.)

If either or both tables in a referential integrity constraint are not version-enabled with valid time support, valid time periods are ignored in enforcing the constraint.

3.7.2 Unique Constraints

If a unique constraint exists in a version-enabled table with valid time support, the valid time periods of rows are considered when the constraint is enforced. For example, assume that an EMPLOYEES table has an EMPLOYEE_ID column that has a unique constraint. If an insert or update operation would result in a new EMPLOYEE_ID value that is the same as an existing EMPLOYEE_ID value, the operation will fail if the WM_VALID values of the existing and inserted rows overlap. (That is, the operation will fail if the new employee and an existing employee have the same ID numbers and their rows are both valid at any given time. However, the operation will succeed if the valid time periods for the two employees do not overlap.)

3.8 Locking with Valid Time Support

If a row in a version-enabled table with valid time support is locked, it is automatically locked for its entire valid time period. There is no way to lock a row for a specified time period.

Any updates in a pessimistically locked workspace will lock the rows seen from an ancestor workspace as the updates are performed in the workspace. The locked rows in ancestor workspaces will not be further updatable in their valid time periods as long as they are locked.

For an explanation of Workspace Manager locking, see Section 1.3.

3.9 Static Data Dictionary Views Affected by Valid Time Support

This section describes the effect on valid time support on Workspace Manager static data dictionary views. These views are documented in Chapter 5.

3.9.1 xxx_CONF Views and Valid Time Support

For a versioned-enabled table with valid time support, the *xxx*_CONF view (described in Section 5.49) will include any temporal conflicts. Such a conflict results when the valid time of a row in a parent workspace, containing the same key as a row in its child workspace, overlaps with the valid time of that row in the child workspace. Setting the session context valid time has no effect on the results of the *xxx*_CONF views, because all applicable conflicts are displayed for the entire time dimension.

For a version-enabled table with valid time support, a column named `WM_VALID`, of type `WM_PERIOD`, is added to the *xxx*_CONF view, to indicate the time period during which the row is valid. A column named `WM_CONFLICTPERIOD`, of type `WM_PERIOD`, is also added to the view, to indicate the overlapping period of the rows for which conflicts were detected.

3.9.2 xxx_DIFF Views and Valid Time Support

For a version-enabled table with valid time support, the *xxx*_DIFF view (described in Section 5.50) will include temporal differences for a primary key between two distinct workspaces or savepoints. Such a difference occurs when a row is modified (inserted, updated, or deleted) in either a parent or child workspace. If two rows with the same primary key value are modified in both a parent and child workspace, the two rows are only correlated in the *xxx*_DIFF view when the valid time ranges of the rows overlap. Setting the session context valid time has no effect on the results of the *xxx*_DIFF views, because all applicable differences are displayed for the entire time dimension.

For a version-enabled table with valid time support, a column named `WM_VALID`, of type `WM_PERIOD`, is added to the *xxx*_DIFF view, to indicate the time period during which the row is valid. A column named `WM_DIFFPERIOD`, of type `WM_PERIOD`, is also added to the view, to indicate the overlapping period of the rows for which a difference was detected.

3.9.3 xxx_HIST Views and Valid Time Support

The *xxx*_HIST views (described in Section 5.51) include information about both valid times and transaction times. It also includes audit information, such as the name of the user that created the row. For a version-enabled table with valid time support, a column named `WM_VALID`, of type `WM_PERIOD`, is added to the *xxx*_HIST view, to indicate the time period during which the row is valid.

3.9.4 xxx_LOCK Views and Valid Time Support

For a version-enabled table with valid time support, a column named `WM_VALID`, of type `WM_PERIOD`, is added to the *xxx*_LOCK view (described in Section 5.52), to indicate the time period during which the row is valid. The row is locked for its entire valid time period, so this is also the locking period.

3.9.5 xxx_MW Views and Valid Time Support

For a version-enabled table with valid time support, a column named `WM_VALID`, of type `WM_PERIOD`, is added to the *xxx*_MW view (described in Section 5.53), to indicate

the time period during which the row is valid. To see only the rows that are valid during a specific period, use the WM_OVERLAPS operator.

3.10 Adding Valid Time Support to an Existing Table

You can add valid time support to an existing version-enabled table by using the AlterVersionedTable procedure. You can specify a valid time period to be set in the WM_VALID column of all existing rows, or you can accept the default period of the current timestamp until changed.

Example 3–15 creates a table named MY_TABLE, version-enables it without valid time support, and then adds valid time support. After the valid time support is added, the WM_VALID column contains the default valid time period.

Example 3–15 Adding Valid Time Support to an Existing Version-Enabled Table

```
CREATE TABLE my_table (id NUMBER PRIMARY KEY);
EXECUTE DBMS_WM.EnableVersioning ('my_table');
INSERT INTO my_table VALUES (1);
SELECT * FROM my_table;

        ID
----------
         1

EXECUTE DBMS_WM.AlterVersionedTable('my_table', 'ADD_VALID_TIME');
SELECT * FROM my_table;

        ID
----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
         1
WM_PERIOD('09-JUN-2003 10:04:13 -04:00', NULL)
```

Part II

Reference Information

This document has three parts:

- Part I provides conceptual and usage information about Workspace Manager.
- Part II provides reference information about the Workspace Manager PL/SQL API (DBMS_WM package) and static data dictionary views.
- Part III provides supplementary information (appendixes and a glossary).

Part II contains the following chapters with reference information:

4

DBMS_WM Package: Reference

Workspace Manager includes PL/SQL subprograms (procedures and functions), in a package named DBMS_WM, that perform the available features of the product. This chapter provides reference information on each subprogram.

> **Note:** Most Workspace Manager subprograms are procedures, but a few are functions. (A function returns a value; a procedure does not return a value.)
>
> Most functions have names starting with *Get* (such as GetConflictWorkspace and GetWorkspace).

The subprograms are presented in alphabetical order. For a brief description of subprograms according to their logical groupings, see Section 1.16.

Errors (exceptions) that can occur with Workspace Manager subprograms are documented in Appendix D, including the cause and suggested user action for each error.

Syntax notes:

- The DBMS_WM public synonym for the Workspace Manager PL/SQL package must be used with the subprogram name. The DBMS_WM public synonym is included in the format and in any examples.
- Subprogram calls are not case-sensitive, except for any quoted literal values. For example, the following code line excerpts are valid and semantically identical:

```
EXECUTE DBMS_WM.CreateWorkspace ('NEWWORKSPACE');
EXECUTE dbms_wm.createworkspace ('NEWWORKSPACE');
EXECUTE dBms_Wm.cReatEwoRksPace ('NEWWORKSPACE');
```

Add_Topo_Geometry_Layer

Adds a topology geometry layer from a version-enabled feature table to a topology.

Format

```
DBMS_WM.Add_Topo_Geometry_Layer(
   topology       IN VARCHAR2,
   table_name     IN VARCHAR2,
   column_name    IN VARCHAR2,
   tg_layer_type  IN VARCHAR2);
```

Parameters

Table 4–1 Add_Topo_Geometry_Layer Procedure Parameters

Parameter	Description
`topology`	Topology to which to add the topology geometry layer containing the topology geometries in the specified column. The topology must have been created using the SDO_TOPO.CREATE_TOPOLOGY procedure.
`table_name`	Name of the topology geometry layer table containing the column specified in `column_name`.
`column_name`	Name of the column (of type `SDO_TOPO_GEOMETRY`) containing the topology geometries in the topology geometry layer to be added to the topology.
`tg_layer_type`	Type of topology geometry layer: `POINT`, `LINE`, `CURVE`, or `POLYGON`.

Usage Notes

This procedure has the same format and meaning as the SDO_TOPO.ADD_TOPO_GEOMETRY_LAYER procedure, which is documented in *Oracle Spatial Topology and Network Data Models Developer's Guide*. However, you must use DBMS_WM.Add_Topo_Geometry_Layer, and not SDO_TOPO.ADD_TOPO_GEOMETRY_LAYER, to add a topology geometry layer from a version-enabled feature table to a topology. For information about Workspace Manager support for topologies, see Section 1.14.

The first call to this procedure for a given topology creates the <topology-name>_RELATION$ table, which is described in *Oracle Spatial Topology and Network Data Models Developer's Guide*.

An exception is raised if `topology`, `table_name`, or `column_name` does not exist, if `topology` or `table_name` is not version-enabled, or if `tg_layer_type` is not one of the supported values.

Examples

The following example adds a topology geometry layer to the `CITY_DATA` topology. The topology geometry layer consists of polygon geometries in the `FEATURE` column of the `LAND_PARCELS` table.

```
EXECUTE DBMS_WM.Add_Topo_Geometry_Layer('CITY_DATA', 'LAND_PARCELS', 'FEATURE',
'POLYGON');
```

AddAsParentWorkspace

Adds a workspace as a parent workspace to a child workspace in a multiparent workspace environment.

Syntax

```
DBMS_WM.AddAsParentWorkspace(
   workspace         IN VARCHAR2,
   parent_workspace  IN VARCHAR2,
   auto_commit       IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–2 AddAsParentWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace to which to add the parent workspace. The name is case-sensitive.
parent_workspace	Name of the workspace to add as a parent workspace of workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

This procedure is part of the support for the multiparent workspaces feature, which is described in Section 1.1.10. If workspace has only one parent workspace, this procedure makes workspace a multiparent workspace. If workspace is already a multiparent workspace, this procedure adds another parent workspace to workspace.

An exception is raised if one or more of the following apply:

- The value of the Workspace Manager system parameter ALLOW_MULTI_PARENT_WORKSPACES is OFF.
- The value of the Workspace Manager system parameter CR_WORKSPACE_MODE or NONR_WORKSPACE_MODE (whichever is applicable, depending on whether or not workspace is a continually refreshed workspace) is OPTIMISTIC_LOCKING.
- workspace or parent_workspace does not exist.
- parent_workspace is already in the ancestor hierarchy of workspace.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- There is a violation of a primary key constraint, referential integrity constraint, or unique constraint in the view of the data in a version-enabled table in workspace.

Examples

The following example adds `Workspace4` as a parent workspace of `Workspace3`. (See the hierarchy illustration in Figure 1–3 in Section 1.1.10.)

```
-- Allow multiparent workspaces. (Required for AddAsParentWorkspace)
EXECUTE DBMS_WM.SetSystemParameter ('ALLOW_MULTI_PARENT_WORKSPACES', 'ON');
-- Make Workspace3 multiparent by adding Workspace4 as a parent.
EXECUTE DBMS_WM.AddAsParentWorkspace ('Workspace3', 'Workspace4');
```

AddUserDefinedHint

Adds a user-defined hint: that is, modifies (and thus overrides) a default optimizer hint, with the goal of improving the performance of SQL statements executed by the DBMS_WM package on a specified version-enabled table or all version-enabled tables.

Syntax

```
DBMS_WM.AddUserDefinedHint(
   hint_id   IN NUMBER,
   table_id  IN VARCHAR2 DEFAULT NULL,
   hint      IN VARCHAR2 DEFAULT NULL);
```

Parameters

Table 4–3 AddUserDefinedHint Procedure Parameters

Parameter	Description
`hint_id`	Numeric ID that uniquely identifies the user-defined hint. Must match an existing hint ID used by Workspace Manager for one or more SQL statements.
`table_id`	Name of the table to which to apply the hint. The name is not case-sensitive. If this value is null, the hint is used with all version-enabled tables for any SQL statements that specify the hint.
`hint`	The text of the optimizer hint. For an explanation of optimizer hints, see the chapter about using optimizer hints in *Oracle Database Performance Tuning Guide*.

Usage Notes

Use this procedure only if you are dissatisfied with the performance of any DBMS_WM package operations, and if you know how to use application tracing and SQL optimizer hints. For information about tracing, see the chapter about application tracing tools in *Oracle Database Performance Tuning Guide*.

In the trace output, any SQL statements using the DBMS_WM package that allow a user-defined hint include one or more comments in the following format:

```
/* WM$SQL (hint_id) (table_id) */
```

If you have identified a statement that is performing poorly, and if you know an optimizer hint that will improve performance, you can use the `AddUserDefinedHint` procedure to specify the hint that should be used for the specified hint ID. You can also indicate whether to use the specified hint associated with the hint ID only for a specified table, or for all tables.

If you specify the `table_id` parameter, the specified hint will be used only when SQL statements that use the hint ID access the specified table, and the default Workspace Manager-supplied hint will be used with other tables. If the `table_id` parameter is null, the specified hint will be used when any DBMS_WM statement use the hint ID.

If the `hint` parameter specifies an object name (such as an index name), the `table_id` parameter must not be null.

Any table aliases can be used within user-defined hints; however, standard scoping rules still apply.

To remove a user-defined hint (that is, to cause the default hint associated with a hint ID to be used), use the RemoveUserDefinedHint procedure.

Examples

The following example specifies a full table scan on the TABLE1 table and any associated Workspace Manager infrastructure tables when a SQL statement specifies hint ID 1101 with the SCOTT.TABLE1 table.

```
EXECUTE DBMS_WM.AddUSerDefinedHint (1101, 'scott.table1', 'full(t1)');
```

AlterSavepoint

Modifies the description of a savepoint.

Syntax

```
DBMS_WM.AlterSavepoint(
   workspace      IN VARCHAR2,
   sp_name        IN VARCHAR2,
   sp_description IN VARCHAR2);
```

Parameters

Table 4–4 AlterSavepoint Procedure Parameters

Parameter	Description
workspace	Name of the workspace in which the savepoint was created. The name is case-sensitive.
sp_name	Name of the savepoint. The name is case-sensitive.
sp_description	Description of the savepoint.

Usage Notes

To see the current description of the savepoint, examine the DESCRIPTION column value for the savepoint in the ALL_WORKSPACE_SAVEPOINTS metadata view, which is described in Section 5.16.

An exception is raised if the user is not the workspace owner or savepoint owner or does not have the WM_ADMIN_ROLE role.

Examples

The following example modifies the description of savepoint SP1 in the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.AlterSavepoint ('NEWWORKSPACE', 'SP1', 'First set of changes for
scenario');
```

AlterVersionedTable

Alters a version-enabled table to add valid time support, rename a constraint, or rename an index.

Syntax

```
DBMS_WM.AlterVersionedTable(
   table_name         IN VARCHAR2,
   alter_option       IN VARCHAR2,
   parameter_options  IN VARCHAR2 DEFAULT NULL,
   ignore_last_error  IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–5 AlterVersionedTable Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table to which to add valid time support. The name is not case-sensitive.
alter_option	One of the following values: ADD_VALID_TIME to add valid time support, DDL to make DDL changes, RENAME_CONSTRAINT to rename a constraint, REBUILD_INDEX to rebuild an index, RENAME_INDEX to rename an index, or either USE_SCALAR_TYPES_FOR_VALIDTIME or USE_WM_PERIOD_FOR_VALIDTIME to specify whether views on an existing version-enabled table should use two scalar columns for the valid time range. See the Usage Notes for information about these options, including when you must and can use this procedure to rename an index or a constraint.
parameter_options	A quoted string (in the general format 'keyword=value, keyword2=value2, ...') containing keywords valid for the specified alter_option parameter value. See the Usage Notes for keywords that are valid for each alter_option parameter value.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the AlterVersionedTable procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the AlterVersionedTable procedure.

Usage Notes

Use this procedure to add valid time support, rename a constraint, or rename an index for an existing version-enabled table. For more information about adding valid time support, see Section 3.10.

If the alter_option value is ADD_VALID_TIME, you can specify none, one, or more of the following parameter_options keywords:

- validFrom: Starting time period to be set in the WM_VALID column of all existing rows. The default value is the current timestamp.

- validTill: Ending time period to be set in the WM_VALID column of all existing rows. The default value is UNTIL_CHANGED.
- fmt: Date format. The default value is 'mmddyyyyhh24miss'. The options are the same as for the TO_TIMESTAMP_TZ function, which is described in *Oracle Database SQL Language Reference*.
- nlsparam: Globalization support options. The options and default are the same as for the nlsparam argument to the TO_CHAR function for date conversion, which is described in *Oracle Database SQL Language Reference*.

If the alter_option value is DDL, the currently supported operations for this procedure are adding, merging, and splitting table partitions. You must have SYSDBA privileges, and you must specify the following parameter_options keywords:

- ddl: The DDL (data definition language) statement to be executed. The DDL statement must refer to the fully qualified base table (for example, SCOTT.EMP_LT if SCOTT.EMP is the version-enabled table).
- force: A value of true causes Workspace Manager to attempt to execute the DDL statement, regardless of whether the operation is officially supported for this procedure; a value of false (the default) causes Workspace Manager not to attempt to execute the DDL statement. Thus, to execute the DDL statement, you must override the default value by explicitly specifying 'force=true'; however, do not specify 'force=true' unless you know what you are doing.

If the alter_option value is RENAME_CONSTRAINT, you must specify both of the following parameter_options keywords:

- constraint_name: The current name of the constraint to be renamed. The name is not case-sensitive.
- new_constraint_name: The new name for the constraint. The name is not case-sensitive.

If the alter_option value is RENAME_INDEX, you must specify all of the following parameter_options keywords:

- index_owner: The name of the schema that owns the index to be renamed. The schema name is not case-sensitive.
- index_name: The current name of the index to be renamed. The name is not case-sensitive.
- new_index_name: The new name for the index. The name is not case-sensitive.

If the name of a constraint or index on a version-enabled table is longer than 26 characters, you must use the AlterVersionedTable procedure if you want to rename the constraint or index; you cannot use the ALTER TABLE (for a constraint) or ALTER INDEX (for an index) statement with the RENAME clause. If you use the AlterVersionedTable procedure, you do not need to include it between calls to the BeginDDL and CommitDDL procedures.

If the name of the constraint or index on a version-enabled table is 26 or fewer characters long, you can do either of the following to rename the constraint or index: use the AlterVersionedTable procedure, or use the ALTER TABLE (for a constraint) or ALTER INDEX (for an index) statement with the RENAME clause between calls to the BeginDDL and CommitDDL procedures (as explained in Section 1.8).

If the alter_option value is REBUILD_INDEX, you must specify the index_owner and index_name keywords to identify the database user that owns the index and the name of the index; and you can specify either the reverse or noreverse keyword,

to specify whether or not to store the bytes of the index block in reverse order, excluding the rowid.

The alter_option values USE_SCALAR_TYPES_FOR_VALIDTIME and USE_WM_PERIOD_FOR_VALIDTIME can be used only to change the views on an existing version-enabled table to be consistent with the current setting for the Workspace Manager system parameter USE_SCALAR_TYPES_FOR_VALIDTIME (described in Section 1.5). For example, if you set the Workspace Manager system parameter USE_SCALAR_TYPES_FOR_VALIDTIME to ON, but an existing version-enabled table named MYTABLE has views that use a single column named WM_VALID (of type WM_PERIOD) to indicate the valid time range, you can change the views on MY_TABLE to use two columns of type TIMESTAMP WITH TIME ZONE by calling the AlterVersionedTable procedure and specifying the alter_option value USE_SCALAR_TYPES_FOR_VALIDTIME.

The alter_option parameter cannot be used to override the current value of the Workspace Manager system parameter USE_SCALAR_TYPES_FOR_VALIDTIME. If the system parameter value is ON, the alter_option parameter value must be USE_SCALAR_TYPES_FOR_VALIDTIME; and if the system parameter value is OFF, the alter_option parameter value must be USE_WM_PERIOD_FOR_VALIDTIME.

You can use double quotation marks for parameter values within the parameter_options string. For example, the following two specifications are semantically identical:

```
'index_owner=scott, index_name=my_index, new_index_name=my_new_index'
'index_owner="scott", index_name="my_index", new_index_name="my_new_index"'
```

If a call to the AlterVersionedTable procedure fails, you should try to fix the cause of the error. Examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message. Fix the cause of the error, and then call the AlterVersionedTable procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you can ignore the error by calling the AlterVersionedTable procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

An exception is raised if one or more of the following apply:

- table_name does not exist.
- alterOptions is not ADD_VALID_TIME.

Examples

The following example creates a table named MY_TABLE, version-enables it without valid time support, and then adds valid time support. After valid time support is added, the WM_VALID column contains the default valid time period.

```
CREATE TABLE my_table (id NUMBER PRIMARY KEY);
EXECUTE DBMS_WM.EnableVersioning ('my_table');
INSERT INTO my_table VALUES (1);
SELECT * FROM my_table;

        ID
----------
         1

EXECUTE DBMS_WM.AlterVersionedTable('my_table', 'ADD_VALID_TIME');
SELECT * FROM my_table;
```

```
        ID
----------
WM_VALID(VALIDFROM, VALIDTILL)
--------------------------------------------------------------------------------
         1
WM_PERIOD('09-JUN-2003 10:04:13 -04:00', NULL)
```

The following example creates a table named SCOTT.MY_TABLE, creates an index named MY_INDEX on the VALUE column in that table, version-enables the table, and then renames the index to MY_NEW_INDEX.

```
CREATE TABLE scott.my_table (id NUMBER PRIMARY KEY, value INTEGER);
CREATE INDEX scott.my_index on scott.my_table(value);
EXECUTE DBMS_WM.EnableVersioning ('scott.my_table');
EXECUTE DBMS_WM.AlterVersionedTable ('scott.my_table', 'RENAME_INDEX',
  'index_owner=scott, index_name=my_index, new_index_name=my_new_index');
```

AlterWorkspace

Modifies the description of a workspace.

Syntax

```
DBMS_WM.AlterWorkspace(
   workspace              IN VARCHAR2,
   workspace_description  IN VARCHAR2);
```

Parameters

Table 4–6 AlterWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
workspace_description	Description of the workspace.

Usage Notes

To see the current description of the workspace, examine the DESCRIPTION column value for the savepoint in the ALL_WORKSPACES metadata view, which is described in Section 5.17.

An exception is raised if the user is not the workspace owner or does not have the WM_ADMIN_ROLE role.

Examples

The following example modifies the description of the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.AlterWorkspace ('NEWWORKSPACE', 'Testing proposed scenario B');
```

BeginBulkLoading

Starts the bulk loading process for a version-enabled table.

Syntax

```
DBMS_WM.BeginBulkLoading(
   table_name            IN VARCHAR2,
   workspace             IN VARCHAR2,
   version               IN INTEGER,
   check_for_duplicates  IN BOOLEAN DEFAULT TRUE,
   ignore_last_error     IN BOOLEAN DEFAULT FALSE,
   single_transaction    IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–7 BeginBulkLoading Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table into which data will be bulk loaded. The name is not case-sensitive.
workspace	Name of the workspace in which bulk loading will be performed. The name is case-sensitive.
version	Version number returned by the GetBulkLoadVersion function.
check_for_duplicates	A Boolean value (TRUE or FALSE). TRUE (the default) checks for rows in the data to be bulk loaded that have the same values in primary key columns. For any duplicate records, only the record with the lowest ROWID value is kept in the table, and the rest are moved to the discards table specified in the call to the CommitBulkLoading procedure. See the Usage Notes for more information about this parameter. FALSE does not check if any rows in the data to be bulk loaded have the same values in primary key columns.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the BeginBulkLoading procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the BeginBulkLoading procedure.

Table 4–7 (Cont.) BeginBulkLoading Procedure Parameters

Parameter	Description
single_transaction	A Boolean value (TRUE or FALSE). TRUE causes Workspace Manager not to perform an internal commit operation after each of several steps that it will perform after you call the CommitBulkLoading procedure, but instead to perform a commit only after it has performed all the necessary steps. TRUE also allows queries to be made on the version-enabled table. FALSE (the default) causes Workspace Manager to perform an internal commit operation after each of several steps that it will perform after you call the CommitBulkLoading procedure, and it also disallows queries to be made on the table until a CommitBulkLoading or RollbackBulkLoading operation is complete. See the Usage Notes for more information about this parameter.

Usage Notes

Before you can begin bulk loading data into a version-enabled table, you must call the GetBulkLoadVersion and BeginBulkLoading procedures. You must end the bulk loading session by calling either the CommitBulkLoading procedure (to commit changes made when the data was loaded) or the RollbackBulkLoading procedure (to roll back changes made when the data was loaded). For more information about bulk loading with Workspace Manager, see Section 1.7.

If single_transaction is FALSE (the default), the BeginBulkLoading procedure drops some internal Workspace Manager views on the table, to prevent DML operations and certain Workspace Manager operations on the table; however, this also prevents any queries from being made using the specified version-enabled table. Regardless of the single_transaction parameter value, and especially if it is FALSE, you should complete the bulk loading as quickly as possible and at a time when applications and users will not need to access the table. The value of the single_transaction parameter must be the same for both the BeginBulkLoading and CommitBulkLoading procedures for a bulk loading session with a specified table.

A TRUE value for the check_for_duplicates parameter does not cause any existing data in the version-enabled table to be checked. If an existing row in the version in which data is being bulk loaded (which could be the latest version of a workspace or the root version) has the same primary key values as a row in the data to be bulk loaded, the behavior depends on the history option setting for the table: if VIEW_WO_OVERWRITE is set, the newly loaded row is chained to the existing row that has the same primary key values; if VIEW_WO_OVERWRITE is not set, the new data is not bulk loaded but is instead moved to the discards table.

If a call to the BeginBulkLoading procedure fails, you should try to fix the cause of the error. Examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message. Fix the cause of the error, and then call the BeginBulkLoading procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the BeginBulkLoading procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

If performance is an issue, carefully consider whether or not you need to check for duplicate records, because a `check_for_duplicates` value of `TRUE` (the default) causes Workspace Manager to perform additional internal processing.

An exception is raised if one or more of the following apply:

- `table_name` does not exist.
- `table_name` is not version-enabled.
- The user does not own the table or does not have the `WM_ADMIN_ROLE` role.

Examples

The following example gets a bulk load version number for the `W1` workspace, and starts the bulk load operation into the `EMP` table in that workspace.

```
DECLARE
  version INTEGER;
BEGIN
  SELECT DBMS_WM.GetBulkLoadVersion ('W1') INTO version FROM DUAL;
  DBMS_WM.BeginBulkLoading ('EMP', 'W1', version);
END;
/
```

BeginDDL

Starts a DDL (data definition language) session for a specified table.

Syntax

```
DBMS_WM.BeginDDL(
   table_name  IN VARCHAR2);
```

Parameters

Table 4–8 BeginDDL Procedure Parameters

Parameter	Description
`table_name`	Name of the version-enabled table. The name is not case-sensitive.

Usage Notes

This procedure starts a DDL session, and it creates a special table whose name is the same as `table_name` but with *_LTS* added to the table name. After calling this procedure, you can perform one or more DDL operations on the table or any indexes or triggers that are based on the table, and then call either the CommitDDL or RollbackDDL procedure.

In addition to creating the special <*table-name*>*_LTS* table, the procedure creates other objects:

- The <*table-name*>*_LTS* table has the same triggers, columns, and indexes as the <*table-name*> table.
- For each parent table with which the <*table-name*> table has a referential integrity constraint, the same constraint is defined for the <*table-name*>*_LTS* table.
- Triggers, columns, and referential integrity constraints on the <*table-name*>*_LTS* table have the same names as the corresponding ones on the <*table-name*> table.
- For each index on the <*table-name*> table, the corresponding index on the <*table-name*>*_LTS* table has a name in the form <*index-name*>*_LTS*.
- The primary key constraint on the <*table-name*>*_LTS* table has a name in the form <*primary-key*>*_LTS*.
- All unique constraints on the <*table-name*>*_LTS* table have a name in the form <*unique-constraint-name*>*_LTS*.

For detailed information about performing DDL operations related to version-enabled tables, see Section 1.8; and for DDL operations on version-enabled tables in an Oracle replication environment, see also Section C.3.

An exception is raised if one or more of the following apply:

- `table_name` does not exist or is not version-enabled.
- `table_name` has a domain index defined on it, and the user has not been directly granted the `CREATE TABLE` and `CREATE SEQUENCE` privileges.
- An open DDL session exists for `table_name`. (That is, the BeginDDL procedure has already been called specifying this table, and the CommitDDL or RollbackDDL procedure has not been called specifying this table.)

Examples

The following example begins a DDL session, adds a column named COMMENTS to the COLA_MARKETING_BUDGET table by using the special table named COLA_MARKETING_BUDGET_LTS, and ends the DDL session by committing the change.

```
EXECUTE DBMS_WM.BeginDDL('COLA_MARKETING_BUDGET');
ALTER TABLE cola_marketing_budget_lts ADD (comments VARCHAR2(100));
EXECUTE DBMS_WM.CommitDDL('COLA_MARKETING_BUDGET');
```

BeginResolve

Starts a conflict resolution session.

Syntax

```
DBMS_WM.BeginResolve(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–9 BeginResolve Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

This procedure starts a conflict resolution session. While this procedure is executing, the workspace is frozen in 1WRITER mode, as explained in Section 1.1.5.

After calling this procedure, you can execute the ResolveConflicts procedure as needed for various tables that have conflicts, and then call either the CommitResolve or RollbackResolve procedure. For more information about conflict resolution, see Section 1.1.4.

An exception is raised if one or more of the following apply:

- There are one or more open database transactions in workspace.
- The user executing the BeginResolve procedure does not have the privilege to access workspace and its parent workspace.

Examples

The following example starts a conflict resolution session in Workspace1.

```
EXECUTE  DBMS_WM.BeginResolve ('Workspace1');
```

ChangeWorkspaceType

Changes a workspace from not continually refreshed to continually refreshed. (*Continually refreshed workspaces* are explained in Section 1.1.9.)

Syntax

```
DBMS_WM.ChangeWorkspaceType(
   workspace       IN VARCHAR2,
   workspace_type  IN VARCHAR2 DEFAULT DBMS_WM.CR_WORKSPACE_TYPE,
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–10 ChangeWorkspaceType Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
workspace_type	Must be DBMS_WM.CR_WORKSPACE_TYPE (the default), for continually refreshed.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

For this release, you can only change a workspace that is not continually refreshed to continually refreshed; you cannot change a continually refreshed workspace to not continually refreshed.

An exception is raised if one or more of the following occur:

- The user is not the owner of workspace, and the user does not have the WM_ADMIN_ROLE role.
- workspace_type is not valid.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The workspace type cannot be changed. For example, the change cannot be made if the Workspace Manager system parameter CR_WORKSPACE_MODE is set to PESSIMISTIC_LOCKING, but the NONCR_WORKSPACE_MODE parameter is set to OPTIMISTIC_LOCKING and there is versioned data in any continually refreshed workspace.

Examples

The following example changes the NEWWORKSPACE workspace type from not continually refreshed to continually refreshed.

```
EXECUTE DBMS_WM.ChangeWorkspaceType ('NEWWORKSPACE');
```

CommitBulkLoading

Ends the bulk loading process for a version-enabled table by committing the bulk load changes.

Syntax

```
DBMS_WM.CommitBulkLoading(
   table_name            IN VARCHAR2,
   discards_table        IN VARCHAR2,
   check_for_duplicates  IN BOOLEAN DEFAULT TRUE,
   enforceUCFlag         IN BOOLEAN DEFAULT TRUE,
   enforceRICFlag        IN BOOLEAN DEFAULT TRUE,
   ignore_last_error     IN BOOLEAN DEFAULT FALSE,
   single_transaction    IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–11 CommitBulkLoading Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table into which data has been bulk loaded. The name is not case-sensitive.
discards_table	Name of the table into which discard records are inserted. The name is not case-sensitive. If the table does not already exist, it is created.
check_for_duplicates	A Boolean value (TRUE or FALSE). TRUE (the default) checks for rows in the data to be bulk loaded that have the same values in primary key columns. For any duplicate records, only the record with the lowest ROWID value is kept in the table, and the rest are moved to the discards table. See the Usage Notes for more information about this parameter. FALSE does not check if any rows in the data to be bulk loaded have the same values in primary key columns.
enforceUCFlag	A Boolean value (TRUE or FALSE). TRUE (the default) enforces any unique constraints defined on to_table, ensuring that the bulk load operation does not violate any such constraints. FALSE does not enforce any unique constraints defined on to_table for the bulk load operation.
enforceRICFlag	A Boolean value (TRUE or FALSE). TRUE (the default) enforces any referential integrity constraints defined on to_table, ensuring that the bulk load operation does not violate any such constraints. FALSE does not enforce any referential integrity constraints defined on to_table for the bulk load operation.

Table 4–11 (Cont.) CommitBulkLoading Procedure Parameters

Parameter	Description
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the CommitBulkLoading procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the CommitBulkLoading procedure.
single_transaction	A Boolean value (TRUE or FALSE). TRUE causes Workspace Manager not to perform an internal commit operation after each of several steps that it performs after you call the CommitBulkLoading procedure, but instead to perform a commit only after it has performed all the necessary steps. FALSE (the default) causes Workspace Manager to perform an internal commit operation after each of several steps that it performs after you call the CommitBulkLoading procedure. The value of this parameter must be the same as when you called the BeginBulkLoading procedure specifying the table in table_name.

Usage Notes

For information about the requirements for bulk loading data into version-enabled tables, see Section 1.7.

This procedure generates versioning metadata for newly loaded data and synchronizes the newly loaded data with the existing versioned data in the table. It can also enforce unique and referential constraints on the newly loaded data. It re-creates all the views that were dropped by the BeginBulkLoading procedure.

A TRUE value for the check_for_duplicates parameter does not cause any existing data in the version-enabled table to be checked. If an existing row in the version in which data is being bulk loaded (which could be the latest version of a workspace or the root version) has the same primary key values as a row in the data to be bulk loaded, the behavior depends on the history option setting for the table: if VIEW_WO_OVERWRITE is set, the newly loaded row is chained to the existing row that has the same primary key values; if VIEW_WO_OVERWRITE is not set, the new data is not bulk loaded but is instead moved to the discards table.

If a call to the CommitBulkLoading procedure fails, you should try to fix the cause of the error. Examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message. Fix the cause of the error, and then call the CommitBulkLoading procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the CommitBulkLoading procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

Note the following performance considerations:

- A TRUE value for check_for_duplicates requires additional processing time, and a TRUE value for enforceUCFlag or enforceRICFlag may require additional processing time.
- If performance is an issue, carefully consider whether or not you need to check for duplicate records.
- If the table does not have unique or referential constraints, setting the enforceUCFlag or enforceRICFlag parameter to TRUE does not have a significant effect on performance.

An exception is raised if one or more of the following apply:

- table_name does not exist.
- table_name is not version-enabled.
- The BeginBulkLoading procedure has not been called on the table.
- The user does not own the table or does not have the WM_ADMIN_ROLE role.

Examples

The following example commits changes made to the EMP table during a bulk load operation, and specifies DISCARDS as the table to hold discard records.

```
EXECUTE DBMS_WM.CommitBulkLoading ('EMP', 'DISCARDS');
```

CommitDDL

Commits DDL (data definition language) changes made during a DDL session for a specified table, and ends the DDL session.

Syntax

```
DBMS_WM.CommitDDL(
   table_name                  IN VARCHAR2,
   ignore_last_error           IN BOOLEAN DEFAULT FALSE,
   enforce_unique_constraints  IN BOOLEAN DEFAULT FALSE,
   enforce_RICs                IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–12 CommitDDL Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table. The name is not case-sensitive.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the CommitDDL procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the CommitDDL procedure.
enforce_unique_constraints	A Boolean value (TRUE or FALSE). TRUE enforces any unique constraints defined on table_name on existing versioned data in the table. This ensures that the DDL changes do not cause any such constraints to be violated, but it causes Workspace Manager to take additional time to perform the operation. FALSE (the default) does not enforce any unique constraints defined on table_name on existing versioned data in the table.
enforce_RICs	A Boolean value (TRUE or FALSE). TRUE enforces any referential integrity constraints defined on table_name on existing versioned data in the table. This ensures that the changes do not cause any such constraints to be violated, but it causes Workspace Manager to take additional time to perform the operation. FALSE (the default) does not enforce any referential integrity constraints defined on table_name on existing versioned data in the table.

Usage Notes

This procedure commits changes that were made to a version-enabled table and to any indexes, triggers, and referential integrity constraints based on the version-enabled table during a DDL session. It also deletes the special *<table-name>_LTS* table that was created by the BeginDDL procedure.

For detailed information about performing DDL operations related to version-enabled tables, see Section 1.8; and for DDL operations on version-enabled tables in an Oracle replication environment, see also Section C.3.

The enforce_unique_constraints and enforce_RICs parameter settings apply only to existing versioned data, and do not affect whether or not existing constraints are enforced for future DML operations on the table.

If a call to the CommitDDL procedure fails, the table is left in an inconsistent state. If this occurs, you should try to fix the cause of the error. Examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message. For example, the CommitDDL procedure might have failed because the tablespace was not large enough to add a column. Fix the cause of the error, and then call the CommitDDL procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the CommitDDL procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

An exception is raised if one or more of the following apply:

- table_name does not exist or is not version-enabled.
- table_name has a domain index defined on it, and the user has not been directly granted the CREATE TABLE and CREATE SEQUENCE privileges.
- An open DDL session does not exist for table_name. (That is, the BeginDDL procedure has not been called specifying this table, or the CommitDDL or RollbackDDL procedure was already called specifying this table.)

Some invalid DDL operations also cause an exception when CommitDDL procedure is called. See Section 1.8 for information about DDL operations that are supported.

Examples

The following example begins a DDL session, adds a column named COMMENTS to the COLA_MARKETING_BUDGET table by using the special table named COLA_MARKETING_BUDGET_LTS, and ends the DDL session by committing the change.

```
EXECUTE DBMS_WM.BeginDDL('COLA_MARKETING_BUDGET');
ALTER TABLE cola_marketing_budget_lts ADD (comments VARCHAR2(100));
EXECUTE DBMS_WM.CommitDDL('COLA_MARKETING_BUDGET');
```

CommitResolve

Ends a conflict resolution session and saves (makes permanent) any changes in the workspace since the BeginResolve procedure was executed.

Syntax

```
DBMS_WM.CommitResolve(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–13 CommitResolve Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

This procedure ends the current conflict resolution session (started by the BeginResolve procedure), and saves all changes in the workspace since the start of the conflict resolution session. Contrast this procedure with the RollbackResolve procedure, which discards all changes.

For more information about conflict resolution, see Section 1.1.4.

An exception is raised if one or more of the following apply:

- There are one or more open database transactions in workspace.
- The procedure was called by a user that does not have the WM_ADMIN_ROLE role or that did not execute the BeginResolve procedure on workspace.

Examples

The following example ends the conflict resolution session in Workspace1 and saves all changes.

```
EXECUTE  DBMS_WM.CommitResolve ('Workspace1');
```

CompressWorkspace

Deletes removable savepoints in a workspace and minimizes the Workspace Manager metadata structures for the workspace. (*Removable savepoints* are explained in Section 1.1.2.)

Syntax

```
DBMS_WM.CompressWorkspace(
   workspace                   IN VARCHAR2,
   compress_view_wo_overwrite  IN BOOLEAN
   firstSP                     IN VARCHAR2 DEFAULT NULL,
   secondSP                    IN VARCHAR2 DEFAULT NULL,
   auto_commit                 IN BOOLEAN DEFAULT TRUE,
   commit_in_batches           IN BOOLEAN DEFAULT FALSE,
   batch_size                  IN VARCHAR2 DEFAULT 'PRIMARY_KEY_RANGE',
   remove_latest_deleted_rows  IN BOOLEAN DEFAULT FALSE);
```

or

```
DBMS_WM.CompressWorkspace(
   workspace          IN VARCHAR2,
   firstSP            IN VARCHAR2 DEFAULT NULL,
   secondSP           IN VARCHAR2 DEFAULT NULL,
   auto_commit        IN BOOLEAN DEFAULT TRUE,
   commit_in_batches  IN BOOLEAN DEFAULT FALSE,
   batch_size         IN VARCHAR2 DEFAULT 'PRIMARY_KEY_RANGE',
   remove_latest_deleted_rows  IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–14 CompressWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
compress_ view_wo_ overwrite	A Boolean value (TRUE or FALSE). TRUE causes history information between the affected savepoints to be deleted even if VIEW_WO_OVERWRITE was specified when versioning was enabled. FALSE causes history information (between the affected savepoints) for a table not to be deleted if VIEW_WO_OVERWRITE was specified when versioning was enabled. (If VIEW_WO_OVERWRITE was not specified for a table, history information for the table is deleted regardless of the parameter value.) FALSE is assumed if the procedure format without this parameter is used.
firstSP	First savepoint. Savepoint names are case-sensitive. If only workspace and firstSP are specified, all removable savepoints between workspace creation and firstSP (but not including firstSP) are deleted. If workspace, firstSP, and secondSP are specified, all removable savepoints from firstSP (and including firstSP if it is a removable savepoint) to secondSP (but not including secondSP) are deleted. If only workspace is specified (no savepoints), all removable savepoints in the workspace are deleted.

Table 4–14 (Cont.) CompressWorkspace Procedure Parameters

Parameter	Description
secondSP	Second savepoint. All removable savepoints from firstSP (and including firstSP if it is a removable savepoint) to secondSP (but not including secondSP) are deleted. However, if secondSP is LATEST, all removable savepoints from firstSP (and including firstSP if it is a removable savepoint) to the end of the workspace are deleted. Savepoint names are case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.
commit_in_batches	A Boolean value (TRUE or FALSE). TRUE causes an internal commit operation to be performed after compression operations on batch_size rows in version-enabled tables. Periodic commit operations can be useful or necessary if version-enabled tables have many rows affected by the compression, which can cause substantial Oracle database resources (such as rollback segments and undo tablespaces) to be used. If you specify TRUE, the auto_commit value must also be TRUE. FALSE (the default) causes internal commit operations not to be performed during the compression operation.
batch_size	Batch size for internal commit operations if commit_in_batches is TRUE; otherwise, the parameter is ignored. If specified, must be TABLE or PRIMARY_KEY_RANGE. TABLE causes an internal commit operation to be performed after compressing each version-enabled table that needs to be compressed. PRIMARY_KEY_RANGE specifies that each table is divided into batches of different ranges of primary key values, and an internal commit operation is to be performed after compressing each batch of rows in each version-enabled table that needs to be compressed. You must previously have generated statistics on the first column of the primary key, such as by using the DBMS_STATS.GATHER_TABLE_STATS procedure on the <*table_name*>_LT table associated with each affected version-enabled table. See the Usage Notes for more information. The following example generates histogram statistics: `EXECUTE DBMS_STATS.GATHER_TABLE_STATS('', 'cola_marketing_budget_lt', estimate_percent=>50, method_opt=>'FOR COLUMNS SIZE 50 product_id');`
remove_latest_deleted_rows	A Boolean value (TRUE or FALSE). TRUE causes any LATEST row that has been deleted and that will not adversely affect conflict resolution to be removed, if workspace is LIVE. A value of TRUE is ignored for other workspaces.) FALSE (the default) causes any LATEST row that has been deleted to be preserved.

Usage Notes

You can compress a workspace when the explicit savepoints (all or some of them) in the workspace are no longer needed. The compression operation is useful for the following reasons:

- You can reuse savepoint names after they are deleted. (You cannot create a savepoint that has the same name as an existing savepoint.)
- Less disk storage is used for Workspace Manager structures (fewer table rows, smaller indexes, less Workspace Manager metadata).
- Because of the reduction in disk space usage, runtime performance for Workspace Manager operations is improved.

This procedure deletes implicit savepoints only if they do not have any child dependencies, and the existence of any such non-removable savepoints will not allow the entire range to be compressed as a single unit. However, you can remove or move such savepoints by using the RemoveWorkspace or RefreshWorkspace procedure, respectively.

While this procedure is executing, the current workspace is frozen in `NO_ACCESS` mode, as explained in Section 1.1.5.

A workspace cannot be compressed if there are any sessions in the workspace (except for the `LIVE` workspace), or if any user has executed a GotoDate operation or a GotoSavepoint operation specifying a savepoint in the workspace.

If the procedure format without the `compress_view_wo_overwrite` parameter is used, a value of `FALSE` is assumed for the parameter.

For information about `VIEW_WO_OVERWRITE` and other history options, see the information about the EnableVersioning procedure.

If you expect to purge a subset of your historical data periodically, such as removing historical data older than one year, plan to create a savepoint at each expected deletion point on the day it occurs. For example, if you plan to purge 2005 historical data when it is a year old, you need to create a savepoint on January 1, 2006. Then, on January 1, 2007 you can call the CompressWorkspace procedure, specifying the workspace name and the January 1, 2006 savepoint, to delete all history that occurred before 2006.

To see if a version-enabled table can be compressed in primary key range batches, check the value of the `BATCH_SIZE` column in the WM_COMPRESS_BATCH_SIZES metadata view, which is described in Section 5.44.

To specify a `batch_size` value of `PRIMARY_KEY_RANGE`, you must first generate either histogram statistics (for columns of type `NUMBER`, `INTEGER`, `DATE`, `TIMESTAMP`, `CHAR`, or `VARCHAR2`) or general statistics (for columns of type `NUMBER`, `INTEGER`, `DATE`, or `TIMESTAMP`) on the first column of the primary key. The procedure DBMS_STATS.GATHER_TABLE_STATS generates general statistics. If general but not histogram statistics are available for columns of type `NUMBER`, `INTEGER`, `DATE`, or `TIMESTAMP`, the Workspace Manager system parameter `NUMBER_OF_COMPRESS_BATCHES` is used to compute the number of batches when `batch_size` is specified as `PRIMARY_KEY_RANGE`. For more information about statistics, see *Oracle Database Performance Tuning Guide*.

An exception is raised if `auto_commit` is `TRUE` and an open transaction exists, if the user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers), or if the user does not have the privilege to access and merge changes in `workspace`.

To compress a workspace and all its descendant workspaces, use the CompressWorkspaceTree procedure.

Examples

The following example compresses `NEWWORKSPACE`.

```
EXECUTE DBMS_WM.CompressWorkspace ('NEWWORKSPACE');
```

The following example compresses NEWWORKSPACE, deleting all explicit savepoints between the creation of the workspace and the savepoint SP1.

```
EXECUTE DBMS_WM.CompressWorkspace ('NEWWORKSPACE', 'SP1');
```

The following example compresses NEWWORKSPACE, deleting the explicit savepoint SP1 and all explicit savepoints up to but not including SP2.

```
EXECUTE DBMS_WM.CompressWorkspace ('NEWWORKSPACE', 'SP1', 'SP2');
```

The following example compresses B_focus_1, accepts the default values for the firstSP and secondSP parameters (that is, deletes all explicit savepoints), and specifies FALSE for the auto_commit parameter.

```
EXECUTE DBMS_WM.CompressWorkspace ('B_focus_1', auto_commit => FALSE);
```

The following example analyzes the COLA_MARKETING_BUDGET_LT table to generate the necessary histogram statistics for the next statement, and then it compresses B_focus_1. The call to the CompressWorkspace procedure accepts the default values for the firstSP, secondSP, and auto_commit parameters; specifies TRUE for the commit_in_batches parameter; and specifies PRIMARY_KEY_RANGE for the batch_size parameter.

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('', 'cola_marketing_budget_lt', estimate_
percent=>50, method_opt=>'FOR COLUMNS SIZE 50 product_id');
EXECUTE DBMS_WM.CompressWorkspace ('B_focus_1', NULL, NULL, NULL, TRUE, 'PRIMARY_
KEY_RANGE');
```

CompressWorkspaceTree

Deletes removable savepoints in a workspace and all its descendant workspaces. (*Removable savepoints* are explained in Section 1.1.2.) It also minimizes the Workspace Manager metadata structures for the affected workspaces, and eliminates any redundant data that might arise from the deletion of the savepoints.

Syntax

```
DBMS_WM.CompressWorkspaceTree(
   workspace                   IN VARCHAR2,
   compress_view_wo_overwrite  IN BOOLEAN DEFAULT FALSE,
   auto_commit                 IN BOOLEAN DEFAULT TRUE,
   commit_in_batches           IN BOOLEAN DEFAULT FALSE,
   batch_size                  IN VARCHAR2 DEFAULT 'PRIMARY_KEY_RANGE',
   remove_latest_deleted_rows  IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–15 CompressWorkspaceTree Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
compress_view_wo_overwrite	A Boolean value (TRUE or FALSE). TRUE causes history information to be deleted even if VIEW_WO_OVERWRITE was specified when versioning was enabled. FALSE (the default) causes history information for a table not to be deleted if VIEW_WO_OVERWRITE was specified when versioning was enabled. (If VIEW_WO_OVERWRITE was not specified for a table, history information for the table is deleted regardless of the parameter value.)
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.
commit_in_batches	A Boolean value (TRUE or FALSE). TRUE causes an internal commit operation to be performed after compression operations on batch_size rows in version-enabled tables. Periodic commit operations can be useful or necessary if version-enabled tables have many rows affected by the compression, which can cause substantial Oracle database resources (such as rollback segments and undo tablespaces) to be used. If you specify TRUE, the auto_commit value must also be TRUE. FALSE (the default) causes internal commit operations not to be performed during the compression operation.

Table 4–15 (Cont.) CompressWorkspaceTree Procedure Parameters

Parameter	Description
batch_size	Batch size for internal commit operations if commit_in_batches is TRUE; otherwise, the parameter is ignored. If specified, must be TABLE or PRIMARY_KEY_RANGE. TABLE causes an internal commit operation to be performed after compressing each version-enabled table that needs to be compressed. PRIMARY_KEY_RANGE specifies that each table is divided into batches of different ranges of primary key values, and an internal commit operation is to be performed after compressing each batch of rows in each version-enabled table that needs to be compressed. You must previously have generated statistics on the first column of the primary key, such as by using the DBMS_STATS.GATHER_TABLE_STATS procedure on the <*table_name*>_LT table associated with each affected version-enabled table. See the Usage Notes for more information. The following example generates histogram statistics: `EXECUTE DBMS_STATS.GATHER_TABLE_STATS('', 'cola_marketing_budget_lt', estimate_percent=>50, method_opt=>'FOR COLUMNS SIZE 50 product_id');`
remove_latest_deleted_rows	A Boolean value (TRUE or FALSE). TRUE causes any LATEST row that has been deleted and that will not adversely affect conflict resolution to be removed, if workspace is LIVE. A value of TRUE is ignored for other values of the workspace parameter.) FALSE (the default) causes any LATEST row that has been deleted to be preserved.

Usage Notes

You can compress a workspace and all its descendant workspaces when the explicit savepoints in the affected workspaces are no longer needed (for example, if you will not need to go to or roll back to any of these savepoints). For example, in the hierarchy shown in Figure 1–1 in Section 1.1.1, a CompressWorkspaceTree operation specifying Workspace1 compresses Workspace1, Workspace2, and Workspace3. (For an explanation of database workspace hierarchy, see Section 1.1.1.)

The compression operation is useful for the following reasons:

- You can reuse savepoint names after they are deleted. (You cannot create a savepoint that has the same name as an existing savepoint.)
- Runtime performance for Workspace Manager operations is improved.
- Less disk storage is used for Workspace Manager structures.

While this procedure is executing, the current workspace is frozen in NO_ACCESS mode, as explained in Section 1.1.5.

A workspace cannot be compressed if there are any sessions in the workspace (except for the LIVE workspace), or if any user has executed a GotoDate operation or a GotoSavepoint operation specifying a savepoint in the workspace.

To see if a version-enabled table can be compressed in primary key range batches, check the value of the BATCH_SIZE column in the WM_COMPRESS_BATCH_SIZES metadata view, which is described in Section 5.44.

To specify a batch_size value of PRIMARY_KEY_RANGE, you must first generate either histogram statistics (for columns of type NUMBER, INTEGER, DATE, TIMESTAMP, CHAR, or VARCHAR2) or general statistics (for columns of type NUMBER, INTEGER, DATE, or TIMESTAMP) on the first column of the primary key. The procedure DBMS_STATS.GATHER_TABLE_STATS generates general statistics. If general but not

histogram statistics are available for columns of type NUMBER, INTEGER, DATE, or TIMESTAMP, the Workspace Manager system parameter NUMBER_OF_COMPRESS_BATCHES is used to compute the number of batches when batch_size is specified as PRIMARY_KEY_RANGE. For more information about statistics, see *Oracle Database Performance Tuning Guide*.

An exception is raised if auto_commit is TRUE and an open transaction exists, if the user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers), or if the user does not have the privilege to access and merge changes in workspace.

If the CompressWorkspaceTree operation fails in any affected workspace, the entire operation is rolled back, and no workspaces are compressed.

To compress a single workspace (deleting all explicit savepoints or just some of them), use the CompressWorkspace procedure.

Examples

The following example compresses NEWWORKSPACE and all its descendant workspaces.

```
EXECUTE DBMS_WM.CompressWorkspaceTree ('NEWWORKSPACE');
```

The following example compresses NEWWORKSPACE and all its descendant workspaces, accepts the default value for the compress_view_wo_overwrite parameter, and specifies FALSE for the auto_commit parameter.

```
EXECUTE DBMS_WM.CompressWorkspaceTree ('NEWWORKSPACE', auto_commit => FALSE);
```

The following example compresses NEWWORKSPACE and all its descendant workspaces; accepts the default value for the compress_view_wo_overwrite and auto_commit parameters; specifies TRUE for the commit_in_batches parameter; and specifies PRIMARY_KEY_RANGE for the batch_size parameter.

```
EXECUTE DBMS_WM.CompressWorkspaceTree ('NEWWORKSPACE', NULL, NULL, TRUE, 'PRIMARY_
KEY_RANGE');
```

CopyForUpdate

Allows LOB columns (BLOB, CLOB, or NCLOB) in version-enabled tables to be modified. Use this procedure only if a version-enabled table has any LOB columns.

Syntax

```
DBMS_WM.CopyForUpdate(
   table_name    IN VARCHAR2,
   where_clause  IN VARCHAR2 DEFAULT '');
```

Parameters

Table 4–16 CopyForUpdate Procedure Parameters

Parameter	Description
table_name	Name of the table containing one or more LOB columns. The name is not case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows affected. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are affected.

Usage Notes

This procedure is intended for use only with version-enabled tables containing one or more large object (LOB) columns. The CopyForUpdate procedure must be used because updates performed using the DBMS_LOB package do not fire INSTEAD OF triggers on the versioning views. Workspace Manager creates INSTEAD OF triggers on the versioning views to implement the copy-on-write semantics. (For non-LOB columns, you can directly perform the update operation, and the triggers work.)

Examples

The following example updates the SOURCE_CLOB column of TABLE1 for the document with DOC_ID = 1.

```
Declare
  clob_var
Begin
   /* This procedure copies the LOB columns if necessary, that is,
      if the row with doc_id = 1 has not been versioned in the
      current version */
   dbms_wm.copyForUpdate('table1', 'doc_id = 1');

   select source_clob into clob_var
   from   table1
   where  doc_id = 1 for update;

   dbms_lob.write(clob_var,<amount>, <offset>, buff);

End;
```

CreateSavepoint

Creates a savepoint for the current version.

Syntax

```
DBMS_WM.CreateSavepoint(
   workspace       IN VARCHAR2,
   savepoint_name  IN VARCHAR2,
   description     IN VARCHAR2 DEFAULT NULL,
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–17 CreateSavepoint Procedure Parameters

Parameter	Description
workspace	Name of the workspace in which to create the savepoint. The name is case-sensitive.
savepoint_name	Name of the savepoint to be created. The name is case-sensitive.
description	Description of the savepoint to be created.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

There are no explicit privileges associated with savepoints; any user who can access a workspace can create a savepoint in the workspace.

This procedure can be performed while there are users in the workspace. There can be open database transactions, but only if these transactions have not modified a versioned table.

While this procedure is executing, the current workspace is frozen in READ_ONLY mode, as explained in Section 1.1.5.

An exception is raised if one or more of the following apply:

- The user is not in the latest version in the workspace (for example, if the user has called the GotoDate procedure).
- workspace does not exist.
- savepoint_name already exists.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The user does not have the privilege to go to the specified workspace.

Examples

The following example creates a savepoint named `Savepoint1` in the `NEWWORKSPACE` workspace.

```
EXECUTE DBMS_WM.CreateSavepoint ('NEWWORKSPACE', 'Savepoint1');
```

CreateWorkspace

Creates a new workspace in the database.

Syntax

```
DBMS_WM.CreateWorkspace(
   workspace    IN VARCHAR2,
   description  IN VARCHAR2 DEFAULT NULL,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

or

```
DBMS_WM.CreateWorkspace(
   workspace    IN VARCHAR2,
   isrefreshed  IN BOOLEAN,
   description  IN VARCHAR2 DEFAULT NULL,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–18 CreateWorkspace Procedure Parameters

Parameter	Description
`workspace`	Name of the workspace. The name is case-sensitive, and it must be unique (no other workspace of the same name). The name must not contain any of the following characters: `"` (double quotes), `'` (single quote), `` ` `` (grave accent), or `|` (vertical bar).
`isrefreshed`	A Boolean value (`TRUE` or `FALSE`). `TRUE` causes the workspace to be continually refreshed. In a **continually refreshed workspace** (described in Section 1.1.9), changes made in the parent workspace are automatically applied to the workspace whenever data changes are committed in the parent workspace or are merged into the parent workspace from another child workspace. That is, you do not need to call the RefreshWorkspace procedure to apply the changes. See the Usage Notes for more information about continually refreshed workspaces. `FALSE` causes the workspace not to be continually refreshed. To refresh the workspace, you must call the RefreshWorkspace procedure. If you use the syntax without the `isrefreshed` parameter, the workspace is not continually refreshed.
`description`	Description of the workspace.
`auto_commit`	A Boolean value (`TRUE` or `FALSE`). `TRUE` (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. `FALSE` causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

The new workspace is a child of the current workspace. If the session has not explicitly entered a workspace, it is in the `LIVE` database workspace, and the new workspace is a child of the `LIVE` workspace. For an explanation of database workspace hierarchy, see Section 1.1.1.

An implicit savepoint is created in the current version of the current workspace. (The current version does not have to be the latest version in the current workspace.) For an explanation of savepoints (explicit and implicit), see Section 1.1.2.

While this procedure is executing, the current workspace is frozen in `READ_ONLY` mode, as explained in Section 1.1.5.

This procedure does not implicitly go to the workspace created. To go to the workspace, use the GotoWorkspace procedure.

The following rules apply to continually refreshed workspaces (`isrefreshed` value of `TRUE`):

- The session must be on the latest version in order to create a continually refreshed workspace.
- You cannot turn off locking using the SetLockingOFF or SetWorkspaceLockModeOFF procedure for a continually refreshed workspace.

An exception is raised if one or more of the following apply:

- `workspace` already exists.
- `auto_commit` is `TRUE` and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The user does not have the privilege to create a workspace.

Examples

The following example creates a workspace named `NEWWORKSPACE` in the database.

```
EXECUTE DBMS_WM.CreateWorkspace ('NEWWORKSPACE');
```

Delete_Topo_Geometry_Layer

Deletes a topology geometry layer from a topology.

Format

```
DBMS_WM.Delete_Topo_Geometry_Layer(
   topology      IN VARCHAR2,
   table_name    IN VARCHAR2,
   column_name   IN VARCHAR2);
```

Parameters

Table 4–19 Delete_Topo_Geometry_Layer Procedure Parameters

Parameter	Description
`topology`	Topology from which to delete the topology geometry layer containing the topology geometries in the specified column. The topology must have been created using the SDO_TOPO.CREATE_TOPOLOGY procedure.
`table_name`	Name of the topology geometry layer table containing the column specified in `column_name`.
`column_name`	Name of the column (of type `SDO_TOPO_GEOMETRY`) containing the topology geometries in the topology geometry layer to be deleted from the topology.

Usage Notes

This procedure has the same format and meaning as the SDO_TOPO.DELETE_TOPO_GEOMETRY_LAYER procedure, which is documented in *Oracle Spatial Topology and Network Data Models Developer's Guide*. However, you must use DBMS_WM.Delete_Topo_Geometry_Layer, and not SDO_TOPO.DELETE_TOPO_GEOMETRY_LAYER, to delete a topology geometry layer from a version-enabled feature table from a topology. For information about Workspace Manager support for topologies, see Section 1.14.

This procedure deletes data associated with the specified topology geometry layer from the edge, node, and face tables (described in *Oracle Spatial Topology and Network Data Models Developer's Guide*).

An exception is generated if `topology` or `table_name` is not version-enabled, or if `table_name` is the only feature table in `topology`.

Examples

The following example deletes the topology geometry layer that is based on the geometries in the `FEATURE` column of the `LAND_PARCELS` table from the topology named `CITY_DATA`.

```
EXECUTE DBMS_WM.Delete_Topo_Geometry_Layer('CITY_DATA', 'LAND_PARCELS',
'FEATURE');
```

DeleteSavepoint

Deletes a savepoint and associated rows in version-enabled tables.

Syntax

```
DBMS_WM.DeleteSavepoint(
   workspace                   IN VARCHAR2,
   savepoint_name              IN VARCHAR2,
   compress_view_wo_overwrite  IN BOOLEAN DEFAULT FALSE,
   auto_commit                 IN BOOLEAN DEFAULT TRUE,
   commit_in_batches           IN BOOLEAN DEFAULT FALSE,
   batch_size                  IN VARCHAR2 DEFAULT 'PRIMARY_KEY_RANGE');
```

Parameters

Table 4–20 DeleteSavepoint Procedure Parameters

Parameter	Description
workspace	Name of the workspace in which the savepoint was created. The name is case-sensitive.
savepoint_name	Name of the savepoint to be deleted. The name is case-sensitive.
compress_view_wo_overwrite	A Boolean value (TRUE or FALSE). TRUE causes history information to be deleted even if VIEW_WO_OVERWRITE was specified when versioning was enabled. FALSE (the default) causes history information for a table not to be deleted if VIEW_WO_OVERWRITE was specified when versioning was enabled. (If VIEW_WO_OVERWRITE was not specified for a table, history information for the table is deleted regardless of the parameter value.)
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.
commit_in_batches	A Boolean value (TRUE or FALSE). TRUE causes an internal commit operation to be performed after compression operations on batch_size rows in version-enabled tables. Periodic commit operations can be useful or necessary if version-enabled tables have many rows affected by the savepoint deletion, which can cause substantial Oracle database resources (such as rollback segments and undo tablespaces) to be used. If you specify TRUE, the auto_commit value must also be TRUE. FALSE (the default) causes internal commit operations not to be performed during the savepoint deletion operation.

Table 4–20 (Cont.) DeleteSavepoint Procedure Parameters

Parameter	Description
batch_size	Batch size for internal commit operations if commit_in_batches is TRUE; otherwise, the parameter is ignored. If specified, must be TABLE or PRIMARY_KEY_RANGE. TABLE causes an internal commit operation to be performed after compressing each version-enabled table that needs to be compressed. PRIMARY_KEY_RANGE specifies that each table is divided into batches of different ranges of primary key values, and an internal commit operation is to be performed after compressing each batch of rows in each version-enabled table that needs to be compressed. You must previously have generated statistics on the first column of the primary key, such as by using the DBMS_STATS.GATHER_TABLE_STATS procedure on the <*table_name*>_LT table associated with each affected version-enabled table. See the Usage Notes for more information. The following example generates histogram statistics: `EXECUTE DBMS_STATS.GATHER_TABLE_STATS('', 'cola_marketing_budget_lt', estimate_percent=>50, method_opt=>'FOR COLUMNS SIZE 50 product_id');`

Usage Notes

You can delete a savepoint when it is no longer needed (for example, you will not need to go to it or roll back to it).

Deleting a savepoint is useful for the following reasons:

- You can reuse a savepoint name after it is deleted. (You cannot create a savepoint that has the same name as an existing savepoint.)
- Runtime performance for Workspace Manager operations is improved.
- Less disk storage is used for Workspace Manager structures.

While this procedure is executing, the current workspace is frozen in NO_ACCESS mode, as explained in Section 1.1.5.

To delete a savepoint, you must have the WM_ADMIN_ROLE role or be the owner of the workspace or the savepoint.

This procedure cannot be executed if there are any sessions with an open database transaction, or if any user has executed a GotoDate operation or a GotoSavepoint operation specifying a savepoint in the workspace.

To specify a batch_size value of PRIMARY_KEY_RANGE, you must first generate either histogram statistics (for columns of type NUMBER, INTEGER, DATE, TIMESTAMP, CHAR, or VARCHAR2) or general statistics (for columns of type NUMBER, INTEGER, DATE, or TIMESTAMP) on the first column of the primary key. The procedure DBMS_STATS.GATHER_TABLE_STATS generates general statistics. If general but not histogram statistics are available for columns of type NUMBER, INTEGER, DATE, or TIMESTAMP, the Workspace Manager system parameter NUMBER_OF_COMPRESS_BATCHES is used to compute the number of batches when batch_size is specified as PRIMARY_KEY_RANGE. For more information about statistics, see *Oracle Database Performance Tuning Guide*.

An exception is raised if one or more of the following apply:

- One or more sessions are already in workspace (unless the workspace is LIVE).
- workspace does not exist.
- savepoint_name does not exist.

- `savepoint_name` is not a removable savepoint. (Removable savepoints are explained in Section 1.1.2.)
- `auto_commit` is `TRUE` and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The user does not have the privilege to go to the specified workspace.

Examples

The following example deletes a savepoint named `Savepoint1` in the `NEWWORKSPACE` workspace.

```
EXECUTE DBMS_WM.DeleteSavepoint ('NEWWORKSPACE', 'Savepoint1');
```

DisableVersioning

Deletes all support structures that were created to enable the table to support versioned rows.

Syntax

```
DBMS_WM.DisableVersioning(
   table_name         IN VARCHAR2,
   force              IN BOOLEAN DEFAULT FALSE,
   ignore_last_error  IN BOOLEAN DEFAULT FALSE,
   isTopology         IN BOOLEAN DEFAULT FALSE,
   keepWMValid        IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–21 DisableVersioning Procedure Parameters

Parameter	Description
table_name	Name of the table or (if isTopology is TRUE) Oracle Spatial topology, or a comma-delimited list of names of tables related by multilevel referential integrity constraints. (Multilevel referential integrity constraints are explained in Section 1.9.1.) Table names are not case-sensitive.
force	A Boolean value (TRUE or FALSE). TRUE forces all data in workspaces other than LIVE to be discarded before versioning is disabled. FALSE (the default) prevents versioning from being disabled if table_name was modified in any workspace other than LIVE and if the workspace that modified table_name still exists.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the DisableVersioning procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the DisableVersioning procedure.
isTopology	A Boolean value (TRUE or FALSE). TRUE indicates that the value specified for the table_name parameter is the name of an Oracle Spatial topology (not a database table name), as explained in Section 1.14. FALSE (the default) indicates that the value specified for the table_name parameter is not an Oracle Spatial topology name.
keepWMValid	A Boolean value (TRUE or FALSE). Applies only if valid time support (described in Chapter 3) has been enabled for the table. TRUE (the default) causes the WM_VALID column and all data in that column to be kept in the table after the procedure completes. FALSE causes the WM_VALID column to be dropped and all data in that column deleted as a result of the procedure. Only the current row for each primary key value is kept.

Usage Notes

This procedure is used to reverse the effect of the EnableVersioning procedure. It deletes the Workspace Manager infrastructure (support structures) for versioning of rows, but does not affect any user data in the LIVE workspace. The workspace hierarchy and any savepoints still exist, but all rows are the same as in the LIVE workspace. (If there are multiple versions in the LIVE workspace of a row in the table for which versioning is disabled, only the most recent version of the row is kept.)

If table_name has valid time support (described in Chapter 3), this procedure deletes the WM_VALID column and all data in that column. If deleting the WM_VALID column would cause a primary key constraint violation, only the row valid at the current time is retained.

If a call to the DisableVersioning procedure fails, the table is left in an inconsistent state. If this occurs, you should try to fix the cause of the error (examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message), and then call the DisableVersioning procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the DisableVersioning procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

Some causes for the failure of the DisableVersioning procedure include the following:

- The table contains much data in workspaces and the size of the undo tablespace required for the DisableVersioning procedure is not sufficient.
- A compilation error occurred while transferring user-defined triggers from the version-enabled table to the version-disabled table.

The DisableVersioning operation fails if the force value is FALSE and any of the following apply:

- The table is being modified by any user in any workspace other than the LIVE workspace.
- There are versioned rows of the table in any workspace other than the LIVE workspace.

Only the owner of a table or a user with the WM_ADMIN_ROLE role can disable versioning on the table.

Tables that are version-enabled and users that own version-enabled tables cannot be deleted. You must first disable versioning on the relevant table or tables.

An exception is raised if the table is not version-enabled.

If you want to disable versioning on a table in an Oracle replication environment, see Section C.2 for guidelines and other information.

For information about Workspace Manager support for tables in an Oracle Spatial topology, see Section 1.14.

Examples

The following example disables the EMPLOYEE table for versioning.

```
EXECUTE DBMS_WM.DisableVersioning ('employee');
```

The following example disables the EMPLOYEE table for versioning and ignores the last error that occurred during the previous call to the DisableVersioning procedure.

```
EXECUTE DBMS_WM.DisableVersioning ('employee', ignore_last_error => true);
```

The following example disables the EMPLOYEE, DEPARTMENT, and LOCATION tables (which have multilevel referential integrity constraints) for versioning.

```
EXECUTE DBMS_WM.DisableVersioning('employee,department,location');
```

DropReplicationSupport

Deletes replication support objects that were created by the GenerateReplicationSupport procedure.

Syntax

```
DBMS_WM.DropReplicationSupport();
```

Parameters

None.

Usage Notes

To use this procedure, you must understand how replication applies to Workspace Manager objects, as explained in Appendix C. You must also understand the major Oracle replication concepts and techniques, which are documented in *Oracle Database Advanced Replication* and *Oracle Database Advanced Replication Management API Reference*.

You must execute this procedure as the replication administrator user at the writer site.

This procedure drops replication support for any version-enabled tables at the nonwriter sites; however, it does not version-disable any version-enabled tables.

Examples

The following example drops replication support that had previously been enabled using the GenerateReplicationSupport procedure.

```
DBMS_WM.DropReplicationSupport();
```

EnableVersioning

Version-enables a table, creating the necessary structures to enable the table to support multiple versions of rows.

Syntax

```
DBMS_WM.EnableVersioning(
   table_name     IN VARCHAR2,
   hist           IN VARCHAR2 DEFAULT 'NONE',
   isTopology     IN BOOLEAN DEFAULT FALSE,
   validTime      IN BOOLEAN DEFAULT FALSE,
   undo_space     IN VARCHAR2 DEFAULT NULL,
   validTimeRange IN WM_PERIOD DEFAULT NULL);
```

Parameters

Table 4–22 EnableVersioning Procedure Parameters

Parameter	Description
table_name	Name of the table or (if isTopology is TRUE) Oracle Spatial topology, or a comma-delimited list of names of tables related by multilevel referential integrity constraints. (Multilevel referential integrity constraints are explained in Section 1.9.1.) The length of a table name must not exceed 25 characters. The table must not contain any columns with names that start with *WM_* or *WM$*. The table name and any column names must not contain any characters that need to be quoted, such as (but not restricted to) !, ?, or *. The table name is not case-sensitive.
hist	History option, for tracking modifications to table_name. Must be one of the following values: NONE: No modifications to the table are tracked. (This is the default.) VIEW_W_OVERWRITE: The *with* overwrite (*W*_OVERWRITE) option. A view named <table_name>_HIST (described in Section 5.51) is created to contain history information, but it will show only the most recent modifications to the same version of the table. A history of modifications to the version is not maintained; that is, subsequent changes to a row in the same version overwrite earlier changes. (The CREATETIME column of the <table_name>_HIST view contains only the time of the most recent update.) VIEW_WO_OVERWRITE: The *without* overwrite (*WO*_OVERWRITE) option. A view named <table_name>_HIST (described in Section 5.51) is created to contain history information, and it will show all modifications to the same version of the table. A history of modifications to the version is maintained; that is, subsequent changes to a row in the same version do not overwrite earlier changes.
isTopology	A Boolean value (TRUE or FALSE). TRUE indicates that the value specified for the table_name parameter is the name of an Oracle Spatial topology (not a database table name), as explained in Section 1.14. FALSE (the default) indicates that the value specified for the table_name parameter is not an Oracle Spatial topology name.
validTime	A Boolean value (TRUE or FALSE). TRUE causes valid time support to be included. Workspace Manager valid time support is explained in Chapter 3. FALSE (the default) causes valid time support not to be included.

Table 4–22 (Cont.) EnableVersioning Procedure Parameters

Parameter	Description
undo_space	A string containing UNLIMITED (for no specified limit) or a number representing the maximum number of bytes for undo space available for the version-enable operation. Example: '1048576' for 1 megabyte. Any value specified overrides the value of the UNDO_SPACE Workspace Manager system parameter (described in Section 1.5).
validTimeRange	An object of type WM_PERIOD (explained in Section 3.2) that specifies the initial valid time range for the WM_VALID column. If you specify a value, you must also specify the validTime parameter value as TRUE. By default, if valid time support is included, the valid time range is from the current system time and until changed.

Usage Notes

The table that is being version-enabled must have a primary key defined. The primary key can be a composite (multicolumn) primary key.

Only the owner of a table or a user with the WM_ADMIN role can enable versioning on the table.

Tables that are version-enabled and users that own version-enabled tables cannot be deleted. You must first disable versioning on the relevant table or tables.

Tables owned by SYS cannot be version-enabled, and version-enabled tables cannot have any associated indexes or triggers owned by SYS.

An exception is raised if one or more of the following apply:

- table_name is already version-enabled.
- table_name contains a list of tables and any of the tables has a referential integrity constraint with a table that is not in the list.
- table_name contains any columns whose names start with *WM_* or *WM$*.
- table_name or the name of any related object of the table (including columns, indexes, and triggers) contains any quoted identifiers.

If the table is version-enabled with the VIEW_WO_OVERWRITE *hist* option specified, this option can later be disabled and re-enabled by calling the SetWoOverwriteOFF and SetWoOverwriteON procedures.

The history option enables you to log and audit modifications.

The history option affects the behavior of the GotoDate procedure. See the Usage Notes for that procedure.

If you expect to purge a subset of your historical data periodically, such as removing historical data older than one year, plan to create a savepoint at each expected deletion point on the day it occurs. For example, if you plan to purge 2005 historical data when it is a year old, you need to create a savepoint on January 1, 2006. Then, on January 1, 2007 you can call the CompressWorkspace procedure, specifying the workspace name and the January 1, 2006 savepoint, to delete all history that occurred before 2006

If you want to version-enable a table in an Oracle replication environment, see Section C.2 for guidelines and other information.

For information about Workspace Manager support for tables in an Oracle Spatial topology, see Section 1.14.

Current notes and restrictions include the following:

- If you have referential integrity constraints on version-enabled tables, note the considerations and restrictions in Section 1.9.1.
- If you have triggers defined on version-enabled tables, note the considerations and restrictions in Section 1.10.
- Constraints and privileges defined on the table are carried over to the version-enabled table.
- DDL operations on version-enabled tables are subject to the procedures and restrictions described in Section 1.8.
- Index-organized tables cannot be version-enabled.
- Object tables cannot be version-enabled.
- A table with one or more columns of LONG data type cannot be version-enabled.
- A table with one or more nested table columns cannot be version-enabled unless the `ALLOW_NESTED_TABLE_COLUMNS` Workspace Manager system parameter is set to `ON`.

Examples

The following example enables versioning on the `EMPLOYEE` table.

```
EXECUTE DBMS_WM.EnableVersioning('employee');
```

The following example enables versioning on the `EMPLOYEE`, `DEPARTMENT`, and `LOCATION` tables, which have multilevel referential integrity constraints.

```
EXECUTE DBMS_WM.EnableVersioning('employee,department,location');
```

Export

Exports data from a version-enabled table (all rows, or as limited by any combination of several parameters) to a staging table.

Syntax

```
DBMS_WM.Export(
   table_name          IN VARCHAR2,
   staging_table       IN VARCHAR2,
   workspace           IN VARCHAR2,
   where_clause        IN VARCHAR2 DEFAULT NULL,
   export_scope        IN VARCHAR2 DEFAULT DBMS_WM.EXPORT_MODIFIED_DATA_ONLY,
   after_savepoint_name  IN VARCHAR2 DEFAULT NULL,
   as_of_savepoint_name  IN VARCHAR2 DEFAULT NULL,
   after_instant       IN DATE DEFAULT NULL,
   as_of_instant       IN DATE DEFAULT NULL,
   versioned_db        IN BOOLEAN DEFAULT TRUE,
   overwrite_existing_data  IN BOOLEAN DEFAULT FALSE,
   auto_commit         IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–23 Export Procedure Parameters

Parameter	Description
table_name	Name of the table containing the data to be exported. The name is not case-sensitive.
staging_table	Name of the table to hold the exported data. Must not exceed 25 characters. The name is not case-sensitive. If the table does not exist, a new table with this name is created, with a structure suitable for Workspace Manager export and import operations. (See the Usage Notes for more information about the staging table.)
workspace	Name of the workspace from which to export the data. The name is case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be exported. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are exported.
export_scope	The scope (amount of data) for the export operation. DBMS_WM.EXPORT_ALL_DATA exports all relevant data in workspace. DBMS_WM.EXPORT_MODIFIED_DATA_ONLY (the default) exports only relevant data that was inserted, updated, or deleted in workspace.
after_savepoint_name	Name of a savepoint: only data inserted, updated, or deleted after this savepoint is exported. If you do not specify after_savepoint_name or as_of_savepoint_name, savepoints are ignored in determining the data to be exported. See the Usage Notes for guidelines relating to the savepoint-related and instant-related parameters.

Table 4–23 (Cont.) Export Procedure Parameters

Parameter	Description
as_of_savepoint_name	Name of a savepoint: only data in the workspace at the time the savepoint was created is exported. If you do not specify after_savepoint_name or as_of_savepoint_name, savepoints are ignored in determining the data to be exported. See the Usage Notes for guidelines relating to the savepoint-related and instant-related parameters.
after_instant	Date/time specification: only data inserted, updated, or deleted after this time is exported. If you do not specify after_instant or as_of_instant, time is ignored in determining the data to be exported. See the Usage Notes for guidelines relating to the savepoint-related and instant-related parameters.
as_of_instant	Date/time specification: only data that was in the workspace at this time is exported. If you do not specify after_instant or as_of_instant, time is ignored in determining the data to be exported. See the Usage Notes for guidelines relating to the savepoint-related and instant-related parameters.
versioned_db	A Boolean value (TRUE or FALSE). TRUE (the default) creates a staging table that contains versioning information. FALSE creates a staging table that contains only user-defined columns and user-visible data.
overwrite_existing_data	A Boolean value (TRUE or FALSE). TRUE overwrites existing data in the staging table with the data that is exported. FALSE (the default) preserves all existing data in the staging table, and raises an exception if the exported data conflicts with the existing data.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

All data that satisfies the where_clause in the version-enabled table table_name, the export_scope parameter, and any parameters relating to a time or a savepoint in workspace is exported to the staging table (staging_table parameter).

Each row of data to be exported is considered to be one of the following: inserted, updated, or deleted in workspace (that is, *modified data*); or data that was not modified in workspace but can be seen in it (that is, *ancestor data*). If data is exported from the LIVE workspace, it is all modified data. If a workspace is created and no data has yet been versioned in it, and the Export procedure is called, all the data is ancestor data.

The first time you export data from a version-enabled table, the staging table should not exist; that is, do not try to create a staging table, but let the procedure create one for you using the name specified for the staging_table parameter. The staging table will contain all columns in the original table (table_name parameter), plus some columns for use by Workspace Manager.

After the staging table is created, you can use it for subsequent export operations from the original table, as long as you have not done any of the following DDL operations on the original table: altered any column names or data types, or modified or deleted the primary key constraint. If you have made any of these alterations to the original table, drop the staging table before you call the Export procedure, so that Workspace Manager can create a new staging table. (If you want to overwrite data in an existing staging table, you must also specify overwrite_existing_data as TRUE.)

The staging table must be in the current user's schema; or if it is in another schema, the current user must have the CREATE ANY TABLE and INSERT ANY TABLE privileges.

It is recommended that you specify no more than one of the following savepoint-related and instant-related parameters: after_savepoint_name, as_of_savepoint_name, after_instant, as_of_instant. If you specify after_savepoint_name and after_instant, the interaction of the two parameters can have complex results. You cannot specify the following parameter combinations: after_savepoint_name and as_of_savepoint_name, after_instant and as_of_instant, or as_of_savepoint_name and as_of_instant.

An exception is raised if one or more of the following apply:

- A specified table, workspace, or savepoint does not exist.
- table_name contains a nested table column.
- table_name contains a column named WM_VALID of type WM_PERIOD. (That is, this procedure is not supported for tables with valid time support, which is explained in Chapter 3.)
- staging_table exists but is not in a valid format for the export operation.
- staging_table is not in the current user's schema and the current user does not have the CREATE TABLE and INSERT TABLE privileges.
- The user does not have the ACCESS_WORKSPACE privilege for workspace or the ACCESS_ANY_WORKSPACE privilege.
- overwrite_existing_data is FALSE and data that needs to be exported already exists in staging_table.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example exports all data from the COLA_MARKETING_BUDGET table in workspace B_Focus_2 into the staging table COLA_MARKETING_BUDGET_STG. (The EXECUTE statement is actually on a single line.)

```
EXECUTE DBMS_WM.Export(table_name => 'COLA_MARKETING_BUDGET', staging_table =>
'COLA_MARKETING_BUDGET_STG', workspace => 'B_focus_2');
```

FindRICSet

Finds tables that need to be version-enabled along with a specified table, due to referential integrity constraint relationships.

Syntax

```
DBMS_WM.FindRICSet(
   table_name    IN VARCHAR2,
   result_table  IN VARCHAR2);
```

Parameters

Table 4–24 FindRICSet Procedure Parameters

Parameter	Description
table_name	Name of the table for which to find all other tables that will need to be version-enabled along with it, because of referential integrity constraint relationships. The name is not case-sensitive.
result_table	Name of the table to hold the results. The name is not case-sensitive. This table must have two columns, TABLE_OWNER and TABLE_NAME, both of type VARCHAR2. If the table does not exist, a new table with this name and the required columns is created.

Usage Notes

Workspace Manager has several considerations relating to referential integrity constraints, as explained in Section 1.9.1. Sometimes, before you can version-enable a table, you must version-enable other tables that are in referential integrity constraints affecting the table. The FindRICSet procedure enables you to find all these other tables.

To display the results, use the SET SERVEROUTPUT ON statement before calling this procedure.

If the result table is not in the current user's schema, the following requirements apply:

- If the result table does not exist, the current user must have the CREATE ANY TABLE privilege.
- If the result table already exists, the current user must have the required privileges to insert into the table.

An exception is raised if one or more of the following apply:

- table_name does not exist.
- result_table exists but is not in a valid format.
- result_table exists and the current user does not have the required privileges to insert into the table.
- result_table does not exist, is specified for a schema other than the current user's schema, and the current user does not have the CREATE ANY TABLE privilege.

Examples

The following example creates two tables, EMPLOYEES and DEPARTMENTS, where DEPARTMENTS.MANAGER_ID has a foreign key relationship referencing EMPLOYEES.EMPLOYEE_ID. The example then finds all tables that would need to be version-enabled if EMPLOYEES and DEPARTMENTS were version-enabled.

The results show that if you want to version-enable the EMPLOYEES table, you must version-enable both the EMPLOYEES and DEPARTMENTS tables; but if you want to version-enable the DEPARTMENTS table, you do not need to version-enable any other tables.

```
create table employees (employee_id number primary key, employee_name
varchar2(30));
create table departments (dept_id number primary key, manager_id number references
employees(employee_id));

-- Check RICs; result table does not already exist.
EXECUTE DBMS_WM.FindRICSet('EMPLOYEES', 'EMPLOYEES_RESULTS');
SELECT * FROM employees_results;

TABLE_OWNER                    TABLE_NAME
------------------------------ ------------------------------
WM_DEVELOPER                   EMPLOYEES
WM_DEVELOPER                   DEPARTMENTS

EXECUTE DBMS_WM.FindRICSet('DEPARTMENTS', 'DEPARTMENTS_RESULTS');
SELECT * FROM departments_results;

TABLE_OWNER                    TABLE_NAME
------------------------------ ------------------------------
WM_DEVELOPER                   DEPARTMENTS
```

FreezeWorkspace

Restricts access to a workspace and the ability of users to make changes in the workspace.

Syntax

```
DBMS_WM.FreezeWorkspace(
   workspace     IN VARCHAR2,
   freezemode    IN VARCHAR2 DEFAULT 'NO_ACCESS',
   freezewriter  IN VARCHAR2 DEFAULT NULL,
   force         IN BOOLEAN DEFAULT FALSE);
```

or

```
DBMS_WM.FreezeWorkspace(
   workspace         IN VARCHAR2,
   session_duration  IN BOOLEAN,
   freezemode        IN VARCHAR2 DEFAULT 'NO_ACCESS',
   freezewriter      IN VARCHAR2 DEFAULT NULL,
   force             IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–25 FreezeWorkspace Procedure Parameters

Parameter	Description
`workspace`	Name of the workspace. The name is case-sensitive.
`session_duration`	A Boolean value (`TRUE` or `FALSE`). `TRUE` causes the workspace to be unfrozen when the session that called the FreezeWorkspace procedure disconnects from the database. This value is valid for all freeze modes. `FALSE` causes the workspace not to be unfrozen when the session that called the FreezeWorkspace procedure disconnects from the database.
`freezemode`	Mode for the frozen workspace. Must be one of the following values: `NO_ACCESS`: No sessions are allowed in the workspace. (This is the default.) `READ_ONLY`: Sessions are allowed in the workspace, but no write operations (insert, update, delete) are allowed. `1WRITER`: Sessions are allowed in the workspace, but only one user (see the `freezewriter` parameter) is allowed to perform write operations (insert, update, delete). `1WRITER_SESSION`: Sessions are allowed in the workspace, but only the database session (as opposed to the database user) that called the FreezeWorkspace procedure is allowed to perform write operations (insert, update, delete). The workspace is unfrozen after the session that called the FreezeWorkspace procedure disconnects from the database. `WM_ONLY`: Only Workspace Manager operations are permitted. No sessions can directly modify data values; however, child workspaces can be merged into the workspace, and savepoints can be created in the workspace.
`freezewriter`	The user that is allowed to make changes in the workspace. Can be specified only if `freezemode` is `1WRITER`. The default is `USER` (the current user).

Table 4–25 (Cont.) FreezeWorkspace Procedure Parameters

Parameter	Description
force	A Boolean value (TRUE or FALSE). TRUE forces the workspace to be frozen even if it is already frozen. For example, this value enables you to freeze the workspace with a different freezemode parameter value without having first to call the UnfreezeWorkspace procedure. FALSE (the default) prevents the workspace from being frozen if it is already frozen.

Usage Notes

If you specify the procedure syntax that does not include the session_duration parameter, it is equivalent to specifying FALSE for that parameter: that is, the workspace is not unfrozen when the session that called the FreezeWorkspace procedure disconnects from the database.

The operation fails if one or more of the following apply:

- workspace is already frozen (unless force is TRUE).
- Any sessions are in workspace and freezemode is NO_ACCESS (specified or defaulted).
- session_duration is FALSE and freezemode is 1WRITER_SESSION.

If freezemode is READ_ONLY or 1WRITER, the workspace cannot be frozen if there is an active database transaction.

You can freeze a workspace only if one or more of the following apply:

- You are the owner of the specified workspace.
- You have the WM_ADMIN_ROLE, the FREEZE_ANY_WORKSPACE privilege, or the FREEZE_WORKSPACE privilege for the specified workspace.

The LIVE workspace can be frozen only if freezemode is READ_ONLY or 1WRITER.

To reverse the effect of FreezeWorkspace, use the UnfreezeWorkspace procedure.

Examples

The following example freezes the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.FreezeWorkspace ('NEWWORKSPACE');
```

GenerateReplicationSupport

Creates necessary structures for multimaster replication of Workspace Manager objects, and starts the master activity for the newly created master group.

Syntax

```
DBMS_WM.GenerateReplicationSupport(
   mastersites       IN VARCHAR2,
   groupname         IN VARCHAR2,
   groupdescription  IN VARCHAR2 DEFAULT 'Replication Group for OWM');
```

Parameters

Table 4–26 GenerateReplicationSupport Procedure Parameters

Parameter	Description
`mastersites`	Comma-delimited list of nonwriter site names (database links) to be added to the Workspace Manager replication environment. Do not include the local site (the writer site) in the list.
`groupname`	Name of the master group to be created. This group will appear as a regular replication master group, and it can be managed from all the Oracle replication interfaces, including Oracle Enterprise Manager.
`groupdescription`	Description of the new master group. The default is `Replication Group for OWM`.

Usage Notes

To use this procedure, you must understand how replication applies to Workspace Manager objects, as explained in Appendix C. You must also understand the major Oracle replication concepts and techniques, which are documented in *Oracle Database Advanced Replication* and *Oracle Database Advanced Replication Management API Reference*.

You must execute this procedure as the replication administrator user at the writer site.

Before executing this procedure, ensure that the following are true:

- There are no workspaces, savepoints, or version-enabled tables on any of the remote sites specified in the `mastersites` list.
- All the remote sites and the local site have the same version of Workspace Manager installed. You can check the Workspace Manager version number in the WM_INSTALLATION metadata view.
- If there are version-enabled tables on the local site, these tables must exist and must not be version-enabled on each of the remote sites.

This procedure performs the following operations:

- Verifies that the local site and all the sites specified in the `mastersites` list are running the same version of Workspace Manager.
- Verifies that there are no workspaces, savepoints, or version-enabled tables on any of the remote sites specified in the `mastersites` list.
- Creates a master group, having the name specified in the `groupname` parameter, with the local site as the master definition site and the writer site.

- Adds the Workspace Manager metadata tables to this group.
- Disables Workspace Manager operations at all the nonwriter sites (the remote sites specified in the `mastersites` list).
- If there are any version-enabled tables at the local site, version-enables these tables at each of the remote sites specified in the `mastersites` list and sets them up for replication.
- Starts the master activity for the newly created master group.

To drop replication support for the Workspace Manager environment, use the DropReplicationSupport procedure.

Examples

The following example generates replication support for the Workspace Manager environment at a hypothetical company.

```
DBMS_WM.GenerateReplicationSupport(
    mastersites       =>  'BACKUP-SITE1.EXAMPLE.COM, BACKUP-SITE2.EXAMPLE.COM'),
    groupname         =>  'OWM-GROUP',
    groupdescription  =>  'OWM Replication group for Example Corp.');
```

GetBulkLoadVersion

Returns a version number to be specified in the call to the BeginBulkLoading procedure and in the SQL*Loader control file.

Format

```
DBMS_WM.GetBulkLoadVersion(
   workspace      IN VARCHAR2,
   savepoint_var  IN DEFAULT LATEST) RETURN INTEGER;
```

Parameters

Table 4–27 GetBulkLoadVersion Function Parameters

Parameter	Description
workspace	Name of the workspace for which to return the bulk load version. The name is case-sensitive.
savepoint_var	The version in the workspace in which data will be bulk loaded. Must be one of the following: LATEST or ROOT_VERSION. LATEST (the default) is the current version in the workspace. ROOT_VERSION is into the root version (version number 0, which is in the LIVE workspace). The root version is the ancestor of all other versions, so data in the root version is visible from all other workspaces (unless non-LIVE workspaces have updated the data). You can specify ROOT_VERSION only if workspace is LIVE.

Usage

Before you can begin bulk loading data into a version-enabled table, you must call the GetBulkLoadVersion and BeginBulkLoading procedures. You must end the bulk loading session by calling either the CommitBulkLoading procedure (to commit changes made when the data was loaded) or the RollbackBulkLoading procedure (to roll back changes made when the data was loaded). For more information about bulk loading with Workspace Manager, see Section 1.7.

An exception is raised if one or more of the following apply:

- workspace does not exist.
- savepoint_var is not a valid value.
- savepoint_var is ROOT_VERSION but workspace is not LIVE.

Examples

The following example gets a bulk load version number for the W1 workspace, and starts the bulk load operation into the EMP table in that workspace.

```
DECLARE
  version INTEGER;
BEGIN
  SELECT DBMS_WM.GetBulkLoadVersion ('W1') INTO version FROM DUAL;
  DBMS_WM.BeginBulkLoading ('EMP', 'W1', version);
END;
/
```

GetConflictWorkspace

Returns the name of the workspace on which the session has performed the SetConflictWorkspace procedure.

Format

```
DBMS_WM.GetConflictWorkspace() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

If the SetConflictWorkspace procedure has not been executed, the name of the current workspace is returned.

Examples

The following example displays the name of the workspace on which the session has performed the SetConflictWorkspace procedure.

```
SELECT DBMS_WM.GetConflictWorkspace FROM DUAL;

GETCONFLICTWORKSPACE
--------------------------------------------------------------------------------
B_focus_2
```

GetDiffVersions

Returns the names of the (workspace, savepoint) pairs on which the session has performed the SetDiffVersions operation.

Format

```
DBMS_WM.GetDiffVersions() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

The returned string is in the format `'(WS1,SP1), (WS2,SP2)'`. This format, including the parentheses, is intended to help you if you later want to use parts of the returned string in a call to the SetDiffVersions procedure.

Examples

The following example displays the names of the (workspace, savepoint) pairs on which the session has performed the SetDiffVersions operation.

```
SELECT DBMS_WM.GetDiffVersions FROM DUAL;

GETDIFFVERSIONS
--------------------------------------------------------------------------------
(B_focus_1, LATEST), (B_focus_2, LATEST)
```

GetLockMode

Returns the locking mode for the current session, which determines whether or not access is enabled to versioned rows and corresponding rows in the previous version.

Format

```
DBMS_WM.GetLockMode() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

This function returns `E`, `S`, `C`, or `NULL`.

- For explanations of `E` (exclusive), `S` (shared), and `C` (carry-forward), see the description of the `lockmode` parameter of the SetLockingON procedure.
- `NULL` indicates that locking is not in effect. (Calling the SetLockingOFF procedure results in this setting.)

For an explanation of Workspace Manager locking, see Section 1.3. See also the descriptions of the SetLockingON and SetLockingOFF procedures.

Examples

The following example displays the locking mode in effect for the session.

```
SELECT DBMS_WM.GetLockMode FROM DUAL;

GETLOCKMODE
--------------------------------------------------------------------------------
C
```

GetMultiWorkspaces

Returns the names of workspaces visible in the multiworkspace views for version-enabled tables.

Format

```
DBMS_WM.GetMultiWorkspaces() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

This procedure returns the names of workspaces visible in the multiworkspace views, which are described in Section 5.53.

If no workspaces are visible in the multiworkspace views, `NULL` is returned. If more than one workspace name is returned, names are separated by a comma (for example: `workspace1,workspace2,workspace3`).

To make a workspace visible in the multiworkspace views, use the SetMultiWorkspaces procedure.

Examples

The following example displays the names of workspaces visible in the multiworkspace views.

```
SELECT DBMS_WM.GetMultiWorkspaces FROM DUAL;
```

GetOpContext

Returns the context of the current operation for the current session.

Format

```
DBMS_WM.GetOpContext() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

This function returns one of the following values:

- `DML`: The current operation is driven by data manipulation language (DML) initiated by the user.
- `MERGE_REMOVE`: The current operation was initiated by a MergeWorkspace procedure call with the `remove_workspace` parameter set to `TRUE` or a MergeTable procedure call with the `remove_data` parameter set to `TRUE`.
- `MERGE_NOREMOVE`: The current operation was initiated by a MergeWorkspace procedure call with the `remove_workspace` parameter set to `FALSE` or a MergeTable procedure call with the `remove_data` parameter set to `FALSE`.

The returned value can be used in user-defined triggers to take appropriate action based on the current operation.

Examples

The following example displays the context of the current operation.

```
SELECT DBMS_WM.GetOpContext FROM DUAL;

GETOPCONTEXT
--------------------------------------------------------------------------------
DML
```

GetPhysicalTableName

Returns the name (<*table_name*>_LT form) of the physical table for a version-enabled table.

Format

```
DBMS_WM.GetPhysicalTableName(
   table_owner  IN VARCHAR2,
   table_name   IN VARCHAR2) RETURN VARCHAR2;
```

Parameters

Table 4–28 GetPhysicalTableName Function Parameters

Parameter	Description
`table_owner`	Name of the schema that owns `table_name`.
`table_name`	Name of the version-enabled table for which to return the name of its associated physical table.

Usage

If `table_name` is a version-enabled table, this function returns the name of the table, whose name is in the form <*table_name*>_LT, that was created by Workspace Manager when the EnableVersioning procedure was called. For information about these <*table_name*>_LT tables, see Section 1.1.11.

If `table_name` is a not a version-enabled table, this function returns `table_name`. Thus, you can also use this function to check whether or not a table is version-enabled (that is, by checking whether a name in the form <*table_name*>_LT or the original table name is returned).

Examples

The following example displays the physical table name associated with the `COLA_MARKETING_BUDGET` table after that table is version-enabled.

```
SELECT DBMS_WM.GetPhysicalTableName('wm_developer', 'cola_marketing_budget')
   FROM DUAL;

DBMS_WM.GETPHYSICALTABLENAME('WM_DEVELOPER','COLA_MARKETING_BUDGET')
--------------------------------------------------------------------------------
COLA_MARKETING_BUDGET_LT
```

GetPrivs

Returns a comma-delimited list of all privileges that the current user has for the specified workspace.

Format

```
DBMS_WM.GetPrivs(
   workspace  IN VARCHAR2) RETURN VARCHAR2;
```

Parameters

Table 4–29 GetPrivs Function Parameters

Parameter	Description
workspace	Name of the workspace for which to return the list of privileges. The name is case-sensitive.

Usage

For information about Workspace Manager privileges, see Section 1.4.

Examples

The following example displays the privileges that the current user has for the B_focus_2 workspace.

```
SELECT DBMS_WM.GetPrivs ('B_focus_2') FROM DUAL;

DBMS_WM.GETPRIVS('B_FOCUS_2')
--------------------------------------------------------------------------------
ACCESS,MERGE,CREATE,REMOVE,ROLLBACK
```

GetSessionInfo

Retrieves information about the current workspace and session context.

Format

```
DBMS_WM.GetSessionInfo(
   workspace     OUT VARCHAR2,
   context       OUT VARCHAR2,
   context_type  OUT VARCHAR2);
```

Parameters

Table 4–30 GetSessionInfo Procedure Parameters

Parameter	Description
workspace	Name of the workspace that the current session is in.
context	The context of the current session in the workspace, expressed as one of the following: LATEST, a savepoint name, or an instant (point in time) in 'DD-MON-YYYY HH24:MI:SS' date format. (See the Usage Notes for details.)
context_type	The type of context for the current session in the workspace. Specifically, one of the following values: LATEST (if context is LATEST), SAVEPOINT (if context is a savepoint name), or INSTANT (if context is an instant).

Usage Notes

This procedure is useful if you need to know where a session is (workspace and context) -- for example, after you have performed a combination of GotoWorkspace, GotoSavepoint, and GotoDate operations.

After the procedure successfully executes, the context parameter contains one of the following values:

- LATEST: The session is currently on the LATEST logical savepoint (explained in Section 1.1.2), and it can see changes as they are made in the workspace. The context is automatically set to LATEST when the session enters the workspace (using the GotoWorkspace procedure).
- A savepoint name: The session is currently on a savepoint in the workspace. The session cannot see changes as they are made in the latest version of the workspace, but instead sees a static view of the data as of the savepoint creation time. The session context is set to the savepoint name after a call to the GotoSavepoint procedure.
- An instant (a point in time): The session is currently on a specific point in time. The session cannot see changes as they are made in the latest version of the workspace, but instead sees a static view of the data as of the specific time. The session context is set to an instant after a call to the GotoDate procedure.

For detailed information about the session context, see Section 1.2.

Examples

The following example retrieves and displays information about the current workspace and context in the session.

```
DECLARE
  current_workspace VARCHAR2(30);
```

```
  current_context VARCHAR2(30);
  current_context_type VARCHAR2(30);
BEGIN
  DBMS_WM.GetSessionInfo(current_workspace,
                         current_context,
                         current_context_type);
  DBMS_OUTPUT.PUT_LINE('Session currently in workspace: ' ||current_workspace);
  DBMS_OUTPUT.PUT_LINE('Session context is: ' ||current_context);
  DBMS_OUTPUT.PUT_LINE('Session context is on: ' ||current_context_type);
END;
/
Session currently in workspace: B_focus_2
Session context is: LATEST
Session context is on: LATEST

PL/SQL procedure successfully completed.
```

GetSystemParameter

Returns the value of a Workspace Manager system parameter.

Syntax

```
DBMS_WM.GetSytstemParameter(
   name    IN VARCHAR2) RETURN VARCHAR2;
```

Parameters

Table 4–31 GetSystemParameter Procedure Parameters

Parameter	Description
name	Name of the Workspace Manager system parameter for which to set the value. The name must be one of the following: ALLOW_CAPTURE_EVENTS, ALLOW_MULTI_PARENT_WORKSPACES, ALLOW_NESTED_TABLE_COLUMNS, CR_WORKSPACE_MODE, FIRE_TRIGGERS_FOR_NONDML_EVENTS, NONCR_WORKSPACE_MODE.

Usage Notes

For information about Workspace Manager system parameters, see Section 1.5.

An exception is raised if the name value is not valid.

Examples

The following checks if multiparent workspaces (described in Section 1.1.10) are allowed.

```
SELECT DBMS_WM.GetSystemParameter ('ALLOW_MULTI_PARENT_WORKSPACES') FROM DUAL;

DBMS_WM.GETSYSTEMPARAMETER('ALLOW_MULTI_PARENT_WORKSPACES')
--------------------------------------------------------------------------------
ON
```

GetValidFrom

Returns the `ValidFrom` attribute of the current session valid time. (Valid time support is described in Chapter 3.)

Format

```
DBMS_WM.GetValidFrom() RETURN TIMESTAMP WITH TIME ZONE;
```

Parameters

None.

Usage Notes

To set the session valid time period, use the SetValidTime procedure.

To get the `ValidTill` attribute of the current session valid time, use the GetValidTill function.

Examples

The following example displays the `ValidFrom` attribute of the current session valid time.

```
SELECT DBMS_WM.GetValidFrom FROM DUAL;

GETVALIDFROM
---------------------------------------------------------------------------
01-JAN-1995 12:00:00 -04:00
```

GetValidTill

Returns the `ValidTill` attribute of the current session valid time. (Valid time support is described in Chapter 3.)

Format

```
DBMS_WM.GetValidTill() RETURN TIMESTAMP WITH TIME ZONE;
```

Parameters

None.

Usage Notes

To set the session valid time period, use the SetValidTime procedure.

To get the `ValidFrom` attribute of the current session valid time, use the GetValidFrom function.

Examples

The following example displays the `ValidTill` attribute of the current session valid time.

```
SELECT DBMS_WM.GetValidTill FROM DUAL;

GETVALIDTILL
--------------------------------------------------------------------------------
01-JAN-1996 12:00:00 -04:00
```

GetWMMetadataSpace

Returns the number of bytes currently used to store the Workspace Manager metadata.

Format

```
DBMS_WM.GetWMMetadataSpace() RETURN NUMBER;
```

Parameters

None.

Usage Notes

The Workspace Manager metadata (views, internal tables, and other objects) is by default stored in the default tablespace of the `WMSYS` user. You cannot directly control the size of the Workspace Manager metadata, but you can control its placement by using the Move_Proc procedure to move the metadata to a different tablespace. You can use the GetWMMetadataSpace function to determine the approximate minimum space that you will need to have available in the tablespace into which you are considering moving the Workspace Manager metadata.

Examples

The following example displays the number of bytes currently used to store the Workspace Manager metadata.

```
SELECT DBMS_WM.GetWMMetadataSpace FROM DUAL;

GETWMMETADATASPACE
------------------
           6750208
```

GetWorkspace

Returns the current workspace for the session.

Format

```
DBMS_WM.GetWorkspace() RETURN VARCHAR2;
```

Parameters

None.

Usage Notes

None.

Examples

The following example displays the current workspace for the session.

```
SELECT DBMS_WM.GetWorkspace FROM DUAL;

GETWORKSPACE
--------------------------------------------------------------------------------
B_focus_2
```

GotoDate

Goes to a point at or near the specified date and time in the current workspace.

Syntax

```
DBMS_WM.GotoDate(
   in_date   IN VARCHAR2,
   fmt       IN VARCHAR2 DEFAULT 'mmddyyyyhh24miss',
   nlsparam  IN VARCHAR2 DEFAULT NULL,
   tsWtz     IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–32 GotoDate Procedure Parameters

Parameter	Description
in_date	Date and time for the read-only view of the workspace. (See the Usage Notes for details.) If in_date is a VARCHAR2 string, it is a date string or a timestamp with time zone, depending on the value of the tsWtz parameter.
fmt	Date format. The options are the same as for the TO_TIMESTAMP_TZ function, which is described in *Oracle Database SQL Language Reference*. Default: 'mmddyyyyhh24miss'
nlsparam	Globalization support options. The options are the same as for the TO_TIMESTAMP_TZ function, which is described in *Oracle Database SQL Language Reference*.
tsWtz	Timestamp with time zone flag. A Boolean value (TRUE or FALSE). TRUE means that in_date is considered a timestamp with time zone information. FALSE (the default) means that in_date is a date string.

Usage Notes

You are presented a read-only view of the current workspace at or near the specified date and time. The exact time point depends on the history option for tracking changes to data in version-enabled tables, as set by the EnableVersioning procedure or modified by the SetWoOverwriteOFF or SetWoOverwriteON procedure:

- NONE: The read-only view reflects the first savepoint after in_date.
- VIEW_W_OVERWRITE: The read-only view reflects the data values in effect at in_date, except if in_date is between two savepoints and data was changed between the two savepoints. In this case, data that had been changed between the savepoints might be seen as empty or as having a previous value. To ensure the most complete and accurate view of the data, specify the VIEW_WO_OVERWRITE history option when version-enabling a table.
- VIEW_WO_OVERWRITE: The read-only view reflects the data values in effect at in_date.

For an explanation of the history options, see the description of the hist parameter for the EnableVersioning procedure.

The following example scenario shows the effect of the VIEW_WO_OVERWRITE setting. Assume the following sequence of events:

1. The MANAGER_NAME value in a row is Adams.
2. Savepoint SP1 is created.
3. The MANAGER_NAME value is changed to Baxter.
4. The time point that will be specified as in_date (in step 7) occurs.
5. The MANAGER_NAME value is changed to Chang. (Thus, the value has been changed both before and after in_date since the first savepoint and before the second savepoint.)
6. Savepoint SP2 is created.
7. A GotoDate operation is executed, specifying the time point in step 4 as in_date.

In the preceding scenario:

- If the history option in effect is VIEW_WO_OVERWRITE, the MANAGER_NAME value after step 7 is Baxter. After step 5, the versioned table has three rows, each with a different MANAGER_NAME value (Adams, Baxter, Chang), because each change is made in a new copy of the row.
- If the history option in effect is VIEW_W_OVERWRITE, no value is seen after step 7. The updates in steps 3 and 5 are made in the same copy of the row, and the update in step 5 overwrites the update in step 3. As a result, after step 5 the versioned table has two rows, with MANAGER_NAME values Adams and Chang. Because the MANAGER_NAME value (Baxter) that was in effect at the specified instant has been overwritten, no row is visible.
- If the history option in effect is NONE, the MANAGER_NAME value after step 7 is Chang, because the first savepoint after the specified instant is SP2. After step 5, the versioned table has two rows, with MANAGER_NAME values Adams and Chang.

The GotoDate procedure should be executed while users exist in the workspace. There are no explicit privileges associated with this procedure.

Examples

The following example goes to a point at or near midnight at the start of 08-Jun-2004, depending on the history option currently in effect.

```
EXECUTE DBMS_WM.GotoDate ('08-JUN-04', 'DD-MON-YY');
```

GotoSavepoint

Goes to the specified savepoint in the current workspace.

Syntax

```
DBMS_WM.GotoSavePoint(
   savepoint_name  IN VARCHAR2 DEFAULT 'LATEST');
```

Parameters

Table 4–33 GotoSavepoint Procedure Parameters

Parameter	Description
savepoint_name	Name of the savepoint. The name is case-sensitive. If savepoint_name is not specified, the default is LATEST.

Usage Notes

You are presented a read-only view of the workspace at the time of savepoint creation. This procedure is useful for examining the workspace from different savepoints before performing a rollback to a specific savepoint by calling the RollbackToSP procedure to delete all rows from that savepoint forward.

This operation can be executed while users exist in the workspace. There are no explicit privileges associated with this operation.

If you do not want to roll back to the savepoint, you can call the GotoSavepoint procedure with a null parameter to go to the currently active version in the workspace. (This achieves the same result as calling the GotoWorkspace procedure and specifying the workspace.)

For more information about savepoints, including the LATEST savepoint, see Section 1.1.2.

Examples

The following example goes to the savepoint named Savepoint1.

```
EXECUTE DBMS_WM.GotoSavepoint ('Savepoint1');
```

GotoWorkspace

Moves the current session to the specified workspace.

Syntax

```
DBMS_WM.GotoWorkspace(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–34 GotoWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

After a user goes to a workspace, modifications to data can be made there.

To go to the live database, specify workspace as LIVE. Because many operations are prohibited when any users (including you) are in the workspace, it is often convenient to go to the LIVE workspace before performing operations on created workspaces.

An exception is raised if one or more of the following apply:

- workspace does not exist.
- The user does not have ACCESS_WORKSPACE privilege for workspace.
- workspace has been frozen in NO_ACCESS mode (see the FreezeWorkspace procedure).

Examples

The following example includes the user in the NEWWORKSPACE workspace. The user will begin to work in the latest version in that workspace.

```
EXECUTE DBMS_WM.GotoWorkspace ('NEWWORKSPACE');
```

The following example includes the user in the LIVE database workspace. By default, when users connect to a database, they are placed in this workspace.

```
EXECUTE DBMS_WM.GotoWorkspace ('LIVE');
```

GrantGraphPriv

Grants privileges on multiparent graph workspaces to users and roles. The `grant_option` parameter enables the grantee to grant the specified privileges to other users and roles.

Syntax

```
DBMS_WM.GrantGraphPriv(
   priv_types      IN VARCHAR2,
   leaf_workspace  IN VARCHAR2,
   grantee         IN VARCHAR2,
   node_types      IN VARCHAR2 DEFAULT '(''R'',''I'',''L'')',
   grant_option    IN VARCHAR2 DEFAULT 'NO',
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–35 GrantGraphPriv Procedure Parameters

Parameter	Description
`priv_types`	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are `ACCESS_WORKSPACE`, `MERGE_WORKSPACE`, `CREATE_WORKSPACE`, `REMOVE_WORKSPACE`, `ROLLBACK_WORKSPACE`, and `FREEZE_WORKSPACE`.
`leaf_workspace`	Name of the leaf workspace in the directed acyclic graph. (Leaf workspaces, directed acyclic graphs, and other concepts related to multiparent workspaces are explained in Section 1.1.10.) The name is case-sensitive.
`grantee`	Name of the user (can be the `PUBLIC` user group) or role to which to grant `priv_types`.
`node_types`	List of letters (in parentheses and comma-delimited) representing the types of nodes on which to grant the privileges: `R` for the root of the graph, `I` for the specified intermediate node, `L` for the leaf of the graph. The default is all types of nodes.
`grant_option`	Specify `YES` to enable the grant option for grantee, or `NO` (the default) to disable the grant option for grantee. The grant option allows `grantee` to grant the privileges specified in `priv_types` on the workspace specified in `leaf_workspace` to other users and roles.
`auto_commit`	A Boolean value (`TRUE` or `FALSE`). `TRUE` (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. `FALSE` causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with GrantWorkspacePriv, which grants workspace-level Workspace Manager privileges on workspaces other than multiparent graph workspaces.

If a user gets a privilege from more than one source and if any of those sources has the grant option for that privilege, the user has the grant option for the privilege. For example, assume that user SCOTT has been granted the ACCESS_WORKSPACE privilege with grant_option as NO, but that the PUBLIC user group has been granted the ACCESS_WORKSPACE privilege with grant_option as YES. Because user SCOTT is a member of PUBLIC, user SCOTT has the ACCESS_WORKSPACE privilege with the grant option.

The WM_ADMIN_ROLE role has all Workspace Manager privileges with the grant option. The WM_ADMIN_ROLE role is automatically given to the DBA role.

The ACCESS_WORKSPACE or ACCESS_ANY_WORKSPACE privilege is needed for all other Workspace Manager privileges.

To revoke workspace-level privileges on multiparent graph workspaces, use the RevokeGraphPriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You do not have the privilege to grant priv_types.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example enables user Smith to access all types of nodes in the directed acyclic graph in which the NEWWORKSPACE workspace is the leaf workspace and to merge changes in these workspaces, and it allows Smith to grant the two specified privileges on the leaf workspace to other users.

```
DBMS_WM.GrantGraphPriv ('ACCESS_WORKSPACE, MERGE_WORKSPACE', 'NEWWORKSPACE',
'Smith', 'YES');
```

GrantPrivsOnPolicy

Grants the privileges required to call the EnableVersioning procedure on a table that contains the specified Oracle Label Security (OLS) policy.

Syntax

```
DBMS_WM.GrantPrivsOnPolicy(
   policy_name  IN VARCHAR2);
```

Parameters

Table 4–36 GrantPrivsOnPolicy Procedure Parameters

Parameter	Description
policy_name	Name of the policy for which privileges need to be granted.

Usage Notes

This procedure grants the necessary privileges on an OLS policy to the WMSYS schema. These privileges are required when executing workspace operations. If multiple tables protected by the same policy need to be version-enabled, this procedure only needs to be executed once.

Examples

The following grants the necessary privileges on a policy named `my_policy`.

```
EXECUTE DBMS_WM.GrantPrivsOnPolicy('my_policy');
```

GrantSystemPriv

Grants system-level privileges (not restricted to a particular workspace) to users and roles. The grant_option parameter enables the grantee to grant the specified privileges to other users and roles.

Syntax

```
DBMS_WM.GrantSystemPriv(
   priv_types    IN VARCHAR2,
   grantee       IN VARCHAR2,
   grant_option  IN VARCHAR2 DEFAULT 'NO',
   auto_commit   IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–37 GrantSystemPriv Procedure Parameters

Parameter	Description
priv_types	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE, CREATE_ANY_WORKSPACE, REMOVE_ANY_WORKSPACE, ROLLBACK_ANY_WORKSPACE, and FREEZE_ANY_WORKSPACE.
grantee	Name of the user (can be the PUBLIC user group) or role to which to grant priv_types.
grant_option	Specify YES to enable the grant option for grantee, or NO (the default) to disable the grant option for grantee. The grant option allows grantee to grant the privileges specified in priv_types to other users and roles.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with GrantWorkspacePriv, which grants workspace-level Workspace Manager privileges with keywords that do not contain ANY and which has a workspace parameter.

If a user gets a privilege from more than one source and if any of those sources has the grant option for that privilege, the user has the grant option for the privilege. For example, assume that user SCOTT has been granted the ACCESS_ANY_WORKSPACE privilege with grant_option as NO, but that the PUBLIC user group has been granted the ACCESS_ANY_WORKSPACE privilege with grant_option as YES. Because user SCOTT is a member of PUBLIC, user SCOTT has the ACCESS_ANY_WORKSPACE privilege with the grant option.

The WM_ADMIN_ROLE role has all Workspace Manager privileges with the grant option. The WM_ADMIN_ROLE role is automatically given to the DBA role.

The ACCESS_WORKSPACE or ACCESS_ANY_WORKSPACE privilege is needed for all other Workspace Manager privileges.

To see which users have been granted Workspace Manager system-level privileges, examine the DBA_WM_SYS_PRIVS metadata view, which is described in Section 5.19.

To revoke system-level privileges, use the RevokeSystemPriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You do not have the privilege to grant priv_types.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example enables user Smith to access any workspace in the database, but does not allow Smith to grant the ACCESS_ANY_WORKSPACE privilege to other users.

```
EXECUTE DBMS_WM.GrantSystemPriv ('ACCESS_ANY_WORKSPACE', 'Smith', 'NO');
```

GrantWorkspacePriv

Grants workspace-level privileges to users and roles. The grant_option parameter enables the grantee to grant the specified privileges to other users and roles.

Syntax

```
DBMS_WM.GrantWorkspacePriv(
   priv_types     IN VARCHAR2,
   workspace      IN VARCHAR2,
   grantee        IN VARCHAR2,
   grant_option   IN VARCHAR2 DEFAULT 'NO',
   auto_commit    IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–38 GrantWorkspacePriv Procedure Parameters

Parameter	Description
priv_types	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are ACCESS_WORKSPACE, MERGE_WORKSPACE, CREATE_WORKSPACE, REMOVE_WORKSPACE, ROLLBACK_WORKSPACE, and FREEZE_WORKSPACE.
workspace	Name of the workspace. The name is case-sensitive.
grantee	Name of the user (can be the PUBLIC user group) or role to which to grant priv_types.
grant_option	Specify YES to enable the grant option for grantee, or NO (the default) to disable the grant option for grantee. The grant option allows grantee to grant the privileges specified in priv_types on the workspace specified in workspace to other users and roles.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with GrantSystemPriv, which grants system-level Workspace Manager privileges with keywords in the form *xxx*_ANY_WORKSPACE (ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE, and so on). Contrast this procedure also with GrantGraphPriv, which grants privileges on multiparent graph workspaces to users and roles.

If a user gets a privilege from more than one source and if any of those sources has the grant option for that privilege, the user has the grant option for the privilege. For example, assume that user SCOTT has been granted the ACCESS_WORKSPACE privilege with grant_option as NO, but that the PUBLIC user group has been granted the ACCESS_WORKSPACE privilege with grant_option as YES. Because user SCOTT is a member of PUBLIC, user SCOTT has the ACCESS_WORKSPACE privilege with the grant option.

The WM_ADMIN_ROLE role has all Workspace Manager privileges with the grant option. The WM_ADMIN_ROLE role is automatically given to the DBA role.

The ACCESS_WORKSPACE or ACCESS_ANY_WORKSPACE privilege is needed for all other Workspace Manager privileges.

To revoke workspace-level privileges, use the RevokeWorkspacePriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You do not have the privilege to grant priv_types.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example enables user Smith to access the NEWWORKSPACE workspace and merge changes in that workspace, and allows Smith to grant the two specified privileges on NEWWORKSPACE to other users.

```
DBMS_WM.GrantWorkspacePriv ('ACCESS_WORKSPACE, MERGE_WORKSPACE', 'NEWWORKSPACE',
'Smith', 'YES');
```

Import

Imports data from a staging table (all rows, or as limited by any combination of several parameters) into a version-enabled table in a specified workspace.

Syntax

```
DBMS_WM.Import(
   staging_table   IN VARCHAR2,
   to_table        IN VARCHAR2,
   to_workspace    IN VARCHAR2,
   from_workspace  IN VARCHAR2 DEFAULT NULL,
   where_clause    IN VARCHAR2 DEFAULT NULL,
   import_scope    IN VARCHAR2 DEFAULT DBMS_WM.IMPORT_ALL_DATA,
   ancestor_savepoint_workspace  IN VARCHAR2 DEFAULT NULL,
   ancestor_savepoint_name       IN VARCHAR2 DEFAULT NULL,
   apply_locks     IN BOOLEAN DEFAULT FALSE,
   enforceUCFlag   IN BOOLEAN DEFAULT TRUE,
   enforceRICFlag  IN BOOLEAN DEFAULT TRUE,
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–39 Import Procedure Parameters

Parameter	Description
staging_table	Name of the table that holds the data that had previously been exported using the Export procedure. The name is not case-sensitive.
to_table	Name of the table into which to import the data. The name is not case-sensitive.
to_workspace	Name of the workspace in which to import the data. The name is case-sensitive.
from_workspace	Name of the workspace from which to import the data. The name is case-sensitive. If the staging table contains versioning information, you must specify from_workspace.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be imported. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in staging_table are imported.
import_scope	The scope (amount of data) for the import operation. DBMS_WM.IMPORT_ALL_DATA (the default) imports all relevant data. DBMS_WM.IMPORT_MODIFIED_DATA_ONLY imports only relevant data that has been inserted, updated, or deleted in from_workspace.
ancestor_ savepoint_ workspace	Name of the workspace containing the ancestor savepoint specified in ancestor_savepoint_name. For the current release, if you specify ancestor_savepoint_workspace, the value must be LIVE. If you specify this parameter, you must also specify ancestor_ savepoint_name.

Table 4–39 (Cont.) Import Procedure Parameters

Parameter	Description
ancestor_ savepoint_name	Name of a savepoint in ancestor_savepoint_workspace. All data that was ancestor data at the time of the export operation (see the Usage Notes for the Export procedure) is imported to the specified savepoint. For the current version, if you specify ancestor_ savepoint_name, the value must be DBMS_WM.ROOT_VERSION. If you specify this parameter, you must also specify ancestor_ savepoint_workspace.
apply_locks	A Boolean value (TRUE or FALSE). TRUE causes any locks that were present on the exported data to be applied to the data when importing, unless a more restrictive lock mode is in effect for the current session. FALSE (the default) ignores any locks on rows in the staging table, but instead always uses the lock mode is in effect for the current session.
enforceUCFlag	A Boolean value (TRUE or FALSE). TRUE (the default) enforces any unique constraints defined on to_ table, ensuring that the import operation does not violate any such constraints. FALSE does not enforce any unique constraints defined on to_table for the import operation.
enforceRICFlag	A Boolean value (TRUE or FALSE). TRUE (the default) enforces any referential integrity constraints defined on to_table, ensuring that the import operation does not violate any such constraints. FALSE does not enforce any referential integrity constraints defined on to_table for the import operation.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

All data that satisfies the where_clause parameter value in the staging table named staging_table and the import_scope parameter value is imported into the version-enabled table named to_table.

The data must have been previously exported to the staging table using the Export procedure.

Each row of data to be imported is considered to be one of the following: inserted, updated, or deleted in from_workspace (that is, *modified data*); or data that was not modified in from_workspace but can be seen in it (that is, *ancestor data*). If data is exported from the LIVE workspace, it is all modified data.

An exception is raised if one or more of the following apply:

- A specified table or workspace does not exist.
- staging_table is not in a valid format for the import operation.

- to_table is not a version-enabled table, or does not have an appropriate definition (for example, contains columns not in the staging table).
- from_workspace is null and staging_table contains versioning information.
- ancestor_savepoint_name is not a valid savepoint in ancestor_savepoint_workspace.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example imports modified data from the staging table COLA_MARKETING_BUDGET_STG in workspace B_focus_2 into the COLA_MARKETING_BUDGET table in workspace B_Focus_1. (The EXECUTE statement is actually on a single line.)

```
EXECUTE DBMS_WM.Import(staging_table => 'COLA_MARKETING_BUDGET_STG',
  to_table => 'COLA_MARKETING_BUDGET', to_workspace => 'B_focus_1',
  from_workspace => 'B_focus_2');
```

IsWorkspaceOccupied

Checks whether or not a workspace has any active sessions.

Syntax

```
DBMS_WM.IsWorkspaceOccupied(
   workspace  IN VARCHAR2) RETURN VARCHAR2;
```

Parameters

Table 4–40 IsWorkspaceOccupied Function Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

This function returns YES if the workspace has any active sessions, and it returns NO if the workspace has no active sessions.

An exception is raised if the LIVE workspace is specified or if the user does not have the privilege to access the workspace.

Examples

The following example checks if any sessions are in the B_focus_2 workspace.

```
SELECT DBMS_WM.IsWorkspaceOccupied('B_focus_2') FROM DUAL;

DBMS_WM.ISWORKSPACEOCCUPIED('B_FOCUS_2')
--------------------------------------------------------------------------------
YES
```

LockRows

Controls access to versioned rows in a specified table and to corresponding rows in the parent workspace.

Syntax

```
DBMS_WM.LockRows(
   workspace     IN VARCHAR2,
   table_name    IN VARCHAR2,
   where_clause  IN VARCHAR2 DEFAULT '',
   lock_mode     IN VARCHAR2 DEFAULT 'E',
   Xmin          IN NUMBER DEFAULT NULL,
   Ymin          IN NUMBER DEFAULT NULL,
   Xmax          IN NUMBER DEFAULT NULL,
   Ymax          IN NUMBER DEFAULT NULL);
```

Parameters

Table 4–41 LockRows Procedure Parameters

Parameter	Description
`workspace`	Name of the workspace. The latest versions of rows visible from the workspace are locked. If a row has not been modified in this workspace, the locked version could be in an ancestor workspace. The name is case-sensitive. A value of `NONE` can be used if `lock_mode` is set to `VE` (version-exclusive). This causes the latest versions of rows to be locked, regardless of the workspaces from which they are visible.
`table_name`	Name of the table or (if `Xmin`, `Ymin`, `Xmax`, and `Ymax` are specified) Spatial topology in which rows are to be locked. The name is not case-sensitive.
`where_clause`	The `WHERE` clause (excluding the `WHERE` keyword) identifying the rows to be locked. Example: `'department_id = 20'` Only primary key columns can be specified in the `WHERE` clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If `where_clause` is not specified, all rows in `table_name` are locked. Do not specify the `where_clause` parameter if `table_name` specifies a Spatial topology name.

Table 4–41 (Cont.) LockRows Procedure Parameters

Parameter	Description
lock_mode	Mode with which to set the locks: E (exclusive), WE (workspace-exclusive), VE (version-exclusive), or S (shared). The default is E. E (exclusive) mode locks the rows in the previous version and the corresponding rows in the current version; no other users in the workspace for either version can change any values. WE (workspace-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values in the current workspace; however, other users in other workspaces can change the values. VE (version-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values; no other users (in any workspace) can change the values. S (shared) mode locks the rows in the previous version and the corresponding rows in the current version; however, other users in the workspace for the current version (but no users in the workspace for the previous version) can change values in these rows.
Xmin, Ymin	For Oracle Spatial topologies only (see Section 1.14.1), the X and Y coordinate values, respectively, of the lower-left corner of the window containing the rows to be locked.You must specify these parameters if you specified a topology name for table_name; otherwise, do not specify these parameters.
Xmax, Ymax	For Oracle Spatial topologies only (see Section 1.14.1), the X and Y coordinate values, respectively, of the upper-right corner of the window containing the rows to be locked.You must specify these parameters if you specified a topology name for table_name; otherwise, do not specify these parameters.

Usage Notes

This procedure affects Workspace Manager locking, which occurs in addition to any standard Oracle database locking. For an explanation of Workspace Manager locking, see Section 1.3.

This procedure does not affect whether Workspace Manager locking is set on or off (determined by the SetLockingON and SetLockingOFF procedures).

To unlock rows, use the UnlockRows procedure.

For information about Workspace Manager locking for tables in an Oracle Spatial topology, see Section 1.14.1.

Examples

The following example locks rows in the EMPLOYEES table where last_name = 'Smith' in the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.LockRows ('NEWWORKSPACE', 'employees', 'last_name = ''Smith''');
```

MergeTable

Applies changes to one or more tables (all rows or as specified in the WHERE clause) in a workspace to its parent workspace.

For a multiparent workspace (explained in Section 1.1.10), applies changes to one or more tables (all rows or as specified in the WHERE clause) from all non-root workspaces in the directed acyclic graph to the multiparent root workspace.

Syntax

```
DBMS_WM.MergeTable(
   workspace         IN VARCHAR2,
   table_id          IN VARCHAR2,
   where_clause      IN VARCHAR2 DEFAULT '',
   create_savepoint  IN BOOLEAN DEFAULT FALSE,
   remove_data       IN BOOLEAN DEFAULT FALSE,
   auto_commit       IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–42 MergeTable Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
table_id	Name of the table or tables containing rows to be merged into the parent workspace. To specify multiple tables, separate the names with commas (for example, 'table1, table2'). The names are not case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be merged into the parent workspace. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are merged.
create_savepoint	A Boolean value (TRUE or FALSE). TRUE creates an implicit savepoint in the parent workspace before the merge operation. For a multiparent workspace, creates an implicit savepoint in the multiparent root workspace before the merge operation. (Implicit and explicit savepoints are described in Section 1.1.2.) FALSE (the default) does not create an implicit savepoint in the parent workspace before the merge operation.
remove_data	A Boolean value (TRUE or FALSE). TRUE removes the data in the table (as specified by the where_clause parameter) in the child workspace. For a multiparent workspace, it removes the data in the table (as specified by the where_clause parameter) in the non-root workspaces in the directed acyclic graph. The remove_data option is permitted only if workspace has no child workspaces (that is, it is a leaf workspace). FALSE (the default) does not remove the data in the table in the child workspace.

Table 4–42 (Cont.) MergeTable Procedure Parameters

Parameter	Description
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

All data that satisfies the where_clause parameter value in the version-enabled table named table_name in workspace is applied to the parent workspace of workspace.

Any locks that are held by rows being merged are released.

If there are conflicts between the workspace being merged and its parent workspace, the merge operation fails and the user must manually resolve conflicts using the <table_name>_CONF view. (Conflict resolution is explained in Section 1.1.4.)

A table cannot be merged in the LIVE workspace (because that workspace has no parent workspace).

An exception is raised if one or more of the following apply:

- The user does not have access to table_id.
- The user does not have the MERGE_WORKSPACE privilege for workspace or the MERGE_ANY_WORKSPACE privilege.
- remove_data is TRUE and there are any child workspaces of any workspace to be removed.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The merge involving a multiparent workspace would cause the violation of a referential integrity constraint or unique constraint in any continually refreshed child workspace of the multiparent root workspace.

Examples

The following example merges changes to the EMP table (in the USER3 schema) where last_name = 'Smith' in NEWWORKSPACE to its parent workspace.

```
EXECUTE DBMS_WM.MergeTable ('NEWWORKSPACE', 'user3.emp', 'last_name = ''Smith''');
```

MergeWorkspace

Applies all changes in a workspace to its parent workspace, and optionally removes the workspace.

For a multiparent workspace (explained in Section 1.1.10), applies all changes in the workspace to all other workspaces in the directed acyclic graph, and optionally removes the non-root workspaces in the directed acyclic graph.

Syntax

```
DBMS_WM.MergeWorkspace(
   workspace         IN VARCHAR2,
   create_savepoint  IN BOOLEAN DEFAULT FALSE,
   remove_workspace  IN BOOLEAN DEFAULT FALSE,
   auto_commit       IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–43 MergeWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
create_savepoint	A Boolean value (TRUE or FALSE). TRUE creates an implicit savepoint in the parent workspace before the merge operation. (Implicit and explicit savepoints are described in Section 1.1.2.) FALSE (the default) does not create an implicit savepoint in the parent workspace before the merge operation.
remove_workspace	A Boolean value (TRUE or FALSE). TRUE removes workspace after the merge operation. For a multiparent workspace, all non-root workspaces in the directed acyclic graph are removed. FALSE (the default) does not remove workspace after the merge operation; the workspace continues to exist.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

All data in all version-enabled tables in workspace is merged to the parent workspace of workspace, and workspace is removed if remove_workspace is TRUE.

If workspace is a continually refreshed child workspace, an exclusive lock is taken on the parent workspace. This exclusive lock blocks other operations on the parent workspace, such as GotoWorkspace, which would try to take a shared lock.

Only the current row version for any given row is merged into the parent workspace. To retain all intermediate row versions and historical copies in the child workspace, the value of `remove_workspace` must be `FALSE` (the default). For more information about how Workspace Manager creates row versions and manages historical copies, see Section 1.1.12.

While this procedure is executing, the current workspace is frozen in `NO_ACCESS` mode and the parent workspace is frozen in `READ_ONLY` mode, as explained in Section 1.1.5.

If there are conflicts between the workspace being merged and its parent workspace, the merge operation fails and the user must manually resolve conflicts using the <table_name>_CONF view. (Conflict resolution is explained in Section 1.1.4.)

If the `remove_workspace` parameter value is `TRUE`, the workspace to be merged must be a leaf workspace, that is, a workspace with no descendant workspaces. (For an explanation of workspace hierarchy, see Section 1.1.1.)

To update rows in the child workspace and merge those changes into the parent workspace in the same transaction, you must specify `autocommit=FALSE` and ensure that no other session (that is, other than the one performing the update transaction) is in the child workspace.

An exception is raised if one or more of the following apply:

- The user does not have the `MERGE_WORKSPACE` privilege for `workspace` or the `MERGE_ANY_WORKSPACE` privilege.
- The user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers).
- `auto_commit` is `TRUE` and there is an open database transaction in any workspace under `workspace` in the workspace hierarchy.
- `remove_workspace` is `TRUE` and there are any sessions in any workspaces under `workspace` in the workspace hierarchy.
- `remove_workspace` is `TRUE` and there are any child workspaces of any workspace to be removed.
- `auto_commit` is `TRUE` and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- The merge of a multiparent workspace would cause the violation of a referential integrity constraint or unique constraint in any continually refreshed child workspace of the multiparent root workspace.

Examples

The following example merges changes in `NEWWORKSPACE` to its parent workspace.

```
EXECUTE DBMS_WM.MergeWorkspace ('NEWWORKSPACE');
```

Move_Proc

Moves the Workspace Manager metadata to a specified tablespace.

Syntax

```
DBMS_WM.Move_Proc(
   dest_tablespace  IN VARCHAR2 DEFAULT 'SYSAUX');
```

Parameters

Table 4–44 Move_Proc Procedure Parameters

Parameter	Description
dest_tablespace	The table space to which to move the Workspace Manager metadata. The default value is the SYSAUX tablespace.

Usage Notes

The Workspace Manager metadata (views, internal tables, and other objects) is by default stored in the default tablespace of the WMSYS user. You cannot directly control the size of the Workspace Manager metadata, but you can control its placement by using this procedure to move the metadata from its current tablespace to a different tablespace. If you call this procedure without specifying the dest_tablespace parameter, the Workspace manager metadata is moved to the SYSAUX tablespace.

Before you move the metadata, you can use the GetWMMetadataSpace function to determine the approximate minimum space that you will need to have available in the tablespace into which you are considering moving the Workspace Manager metadata.

Examples

The following example moves the Workspace Manager metadata to the TBLSP_1 tablespace.

```
EXECUTE DBMS_WM.Move_proc('TBLSP_1');
```

PurgeTable

Removes rows (all rows, or as limited by any combination of several parameters) from a version-enabled table, and optionally inserts them into an archive table.

Syntax

```
DBMS_WM.PurgeTable(
   table_id       IN VARCHAR2,
   archive_table  IN VARCHAR2 DEFAULT NULL,
   where_clause   IN VARCHAR2 DEFAULT NULL,
   workspace      IN VARCHAR2 DEFAULT 'LIVE',
   savepoint_name IN VARCHAR2 DEFAULT NULL,
   instant        IN TIMESTAMP WITH TIME ZONE DEFAULT NULL,
   purgeAfter     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–45 PurgeTable Procedure Parameters

Parameter	Description
table_id	Name of the table containing the data to be exported. The name is not case-sensitive.
archive_table	Name of the table into which to insert the purged rows. If this parameter is not specified, purged rows are not archived. If this parameter is specified and if there is an open transaction, the transaction is committed before the table is created, and a new transaction is opened.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be purged. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are purged.
workspace	Name of the workspace from which to purge the data. The name is case-sensitive.
savepoint_name	Name of a savepoint: only data in the workspace either after or before (depending on the purgeAfter value) the time the savepoint was created is purged. You cannot specify both the savepoint_name and instant parameters.
instant	Date/time specification: only data that was in the workspace either after or before (depending on the purgeAfter value) this time is purged. You cannot specify both the savepoint_name and instant parameters.
purgeAfter	A Boolean value (TRUE or FALSE). TRUE (the default) causes rows in the workspace *after* any specified savepoint_name or instant value to be purged. FALSE causes rows in the workspace *before* any specified savepoint_name or instant value to be purged.

Usage Notes

This procedure removes rows from a version-enabled table that is rooted at workspace. If the `purgeAfter` parameter value is `TRUE` (the default), applicable *child* rows rooted at the specified workspace are removed; if the `purgeAfter` parameter value is `FALSE`, applicable *ancestor* rows rooted at the specified workspace are removed.

You can use the `where_clause` parameter and the `savepoint_name` or `instant` parameter to limit the rows that are purged. For most uses of the procedure, you will probably want to specify a `where_clause` value to limit the rows to be purged; otherwise all rows are purged (unless limited by the `savepoint_name` or `instant` parameter).

An exclusive lock is obtained on the version-enabled table for the duration of the procedure.

Examples

The following example purges any rows where the `ID` (primary ley) column value is 20 in the `USER2.TEST` table of the `project` workspace and its descendent workspaces. (The `EXECUTE` statement is actually on a single line.)

```
EXECUTE DBMS_WM.PurgeTable('user2.test', where_clause=>'id=20',
workspace=>'project', purgeAfter=>TRUE);
```

RecoverAllMigratingTables

Attempts to complete the migration process on all tables that were left in an inconsistent state after the Workspace Manager migration procedure failed.

Syntax

```
DBMS_WM.RecoverAllMigratingTables(
   ignore_last_error IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–46 RecoverAllMigratingTables Procedure Parameters

Parameter	Description
ignore_ last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the migration process. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the migration process.

Usage Notes

If an error occurs while you are upgrading (migrating) to the current Workspace Manager release, one or more version-enabled tables can be left in an inconsistent state. (For information about upgrading to the current release, see Section B.1.) If the upgrade procedure fails, you should try to fix the cause of the error (examine the USER_WM_VT_ERRORS or ALL_WM_VT_ERRORS metadata view to see the SQL statement and error message), and then call the RecoverMigratingTable procedure (for a single table) or RecoverAllMigratingTables procedure (for all tables) with the default ignore_last_error parameter value of FALSE, to try to complete the upgrade process.

However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the RecoverMigratingTable or RecoverAllMigratingTables procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

Examples

The following example attempts to recover all version-enabled tables that were left in an inconsistent state when the upgrade procedure failed.

```
EXECUTE DBMS_WM.RecoverAllMigratingTables;
```

The following example attempts to recover all version-enabled tables that were left in an inconsistent state when the upgrade procedure failed, and it ignores the last error that caused the upgrade procedure to fail.

```
EXECUTE DBMS_WM.RecoverAllMigratingTables(TRUE);
```

RecoverFromDroppedUser

Performs necessary operations after the dropping of one or more database users that owned one or more version-enabled tables.

Syntax

```
DBMS_WM.RecoverFromDroppedUser(
   ignore_last_error IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–47 RecoverFromDroppedUser Procedure Parameters

Parameter	Description
ignore_ last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the RecoverFromDroppedUser procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the RecoverFromDroppedUser procedure.

Usage Notes

If a database user with one or more version-enabled tables is dropped, you must execute this procedure as soon as possible. This procedure removes any foreign key constraints in existing tables that depended on any of the version-enabled tables that were dropped as a result of dropping the user that owned these tables. This procedure also fixes any invalid database metadata.

If a call to the RecoverFromDroppedUser procedure fails, the table is left in an inconsistent state. If this occurs, you should try to fix the cause of the error (examine the DBA_WM_VT_ERRORS metadata view to see the SQL statement and error message), and then call the RecoverFromDroppedUser procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the RecoverFromDroppedUser procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

To execute this procedure, you must connect to the database instance as a user with SYSDBA privileges.

Examples

The following drops a user named HERMAN that owns one or more version-enabled tables, and then performs the necessary operations after the drop operation.

```
DROP USER herman CASCADE;
EXECUTE DBMS_WM.RecoverFromDroppedUser;
```

RecoverMigratingTable

Attempts to complete the migration process on a table that was left in an inconsistent state after the Workspace Manager migration procedure failed.

Syntax

```
DBMS_WM.RecoverMigratingTable(
   table_name        IN VARCHAR2,
   ignore_last_error IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–48 RecoverMigratingTable Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table to be recovered from the migration error. The name is not case-sensitive.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the migration process. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the migration process.

Usage Notes

If an error occurs while you are upgrading to the current Workspace Manager release, one or more version-enabled tables can be left in an inconsistent state. (For information about upgrading to the current release, see Section B.1.) If the upgrade procedure fails, you should try to fix the cause of the error (examine the USER_WM_VT_ERRORS or ALL_WM_VT_ERRORS metadata view to see the SQL statement and error message), and then call the RecoverMigratingTable procedure (for a single table) or RecoverAllMigratingTables procedure (for all tables) with the default ignore_last_error parameter value of FALSE, to try to complete the upgrade process.

However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the RecoverMigratingTable or RecoverAllMigratingTables procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

An exception is raised if table_name does not exist or is not version-enabled.

Examples

The following example attempts to recover the COLA_MARKETING_BUDGET table from the error that caused the upgrade procedure to fail.

```
EXECUTE DBMS_WM.RecoverMigratingTable('COLA_MARKETING_BUDGET');
```

The following example attempts to recover the COLA_MARKETING_BUDGET table and ignores the last error that caused the upgrade procedure to fail.

```
EXECUTE DBMS_WM.RecoverMigratingTable('COLA_MARKETING_BUDGET', TRUE);
```

RefreshTable

Applies to a workspace all changes made to a table (all rows or as specified in the WHERE clause) in its parent workspace.

For a multiparent workspace (explained in Section 1.1.10), applies changes from the non-leaf workspaces in the directed acyclic graph to the specified leaf workspace for a specified table. (The table data in the intermediate workspaces is not changed.)

Syntax

```
DBMS_WM.RefreshTable(
   workspace     IN VARCHAR2,
   table_id      IN VARCHAR2,
   where_clause  IN VARCHAR2 DEFAULT '',
   auto_commit   IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–49 RefreshTable Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
table_id	Name of the table containing the rows to be refreshed using values from the parent workspace. The name is not case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be refreshed from the parent workspace. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are refreshed.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

This procedure applies to workspace all changes in rows that satisfy the where_clause parameter value in the version-enabled table named table_id in the parent workspace since the time when workspace was created or last refreshed.

If there are conflicts between the workspace being refreshed and its parent workspace, the refresh operation fails and the user must manually resolve conflicts using the <table_name>_CONF view. (Conflict resolution is explained in Section 1.1.4.)

This procedure is ignored if workspace is a continually refreshed workspace.

A table cannot be refreshed in the LIVE workspace (because that workspace has no parent workspace).

An exception is raised if the user does not have access to table_id, if the user does not have the MERGE_WORKSPACE privilege for workspace or the MERGE_ANY_WORKSPACE privilege, or if auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example refreshes NEWWORKSPACE by applying changes made to the EMPLOYEES table where last_name = 'Smith' in its parent workspace.

```
EXECUTE DBMS_WM.RefreshTable ('NEWWORKSPACE', 'employees', 'last_name =
''Smith''');
```

RefreshWorkspace

Applies to a workspace all changes made in its parent workspace.

For a multiparent workspace (explained in Section 1.1.10), applies changes from the non-leaf workspaces in the directed acyclic graph to the specified leaf workspace. The changes are propagated beginning with the multiparent root workspace and continuing with the intermediate workspaces.

Syntax

```
DBMS_WM.RefreshWorkspace(
   workspace    IN VARCHAR2,
   auto_commit  IN BOOLEAN DEFAULT TRUE,
   copy_data    IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–50 RefreshWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.
copy_data	A Boolean value (TRUE or FALSE). TRUE causes all changes in the parent workspace since the creation or last refresh of the child workspace to be copied to the child workspace. No changes occur in any descendent of the child workspace, and the history of changes to the child workspace is preserved. FALSE (the default) causes minimal data to be copied to the child workspace. The parent version of the child workspace is updated in order for the child workspace and its descendents to have access to the modified rows from the parent workspace. No history of changes to the child workspace is recorded for the operation.

Usage Notes

This procedure applies to workspace all changes made to version-enabled tables in the parent workspace since the time when workspace was created or last refreshed.

If there are conflicts between the workspace being refreshed and its parent workspace, the refresh operation fails and the user must manually resolve conflicts using the <table_name>_CONF view. (Conflict resolution is explained in Section 1.1.4.)

The specified workspace and the parent workspace are frozen in READ_ONLY mode, as explained in Section 1.1.5.

The LIVE workspace cannot be refreshed (because it has no parent workspace).

This procedure is ignored if workspace is a continually refreshed workspace.

An exception is raised if the user does not have the MERGE_WORKSPACE privilege for workspace or the MERGE_ANY_WORKSPACE privilege, if the user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers), or if auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example refreshes NEWWORKSPACE by applying changes made in its parent workspace.

```
EXECUTE DBMS_WM.RefreshWorkspace ('NEWWORKSPACE');
```

RelocateWriterSite

Makes one of the nonwriter sites the new writer site in a Workspace Manager replication environment. (The old writer site becomes one of the nonwriter sites.)

Syntax

```
DBMS_WM.RelocateWriterSite(
   newwritersite           IN VARCHAR2,
   oldwritersiteavailable  IN BOOLEAN);
```

Parameters

Table 4–51 RelocateWriterSite Procedure Parameters

Parameter	Description
`newwritersite`	Name of a current nonwriter site (database link) to be made the new writer site in the Workspace Manager replication environment.
`oldwritersiteavailable`	A Boolean value (`TRUE` or `FALSE`). `TRUE` causes the old writer site to be updated to reflect the fact that the writer site has changed. `FALSE` causes the old writer site not to be updated to reflect the fact that the writer site has changed. In this case, you must use the SynchronizeSite procedure when the old writer site becomes available.

Usage Notes

To use this procedure, you must understand how replication applies to Workspace Manager objects, as explained in Appendix C. You must also understand the major Oracle replication concepts and techniques, which are documented in *Oracle Database Advanced Replication* and *Oracle Database Advanced Replication Management API Reference*.

You must execute this procedure as the replication administrator user. You can execute it at any master site.

You should specify the `oldwritersiteavailable` parameter as `TRUE` if the old writer site is currently available. If you specify the `oldwritersiteavailable` parameter as `FALSE`, you must execute the SynchronizeSite procedure after the old writer site becomes available, to bring that site up to date.

This procedure performs the following operations:

- If `oldwritersiteavailable` is `TRUE`, disables workspace operations and DML and DDL operations for all version-enabled tables on the old writer site.
- Enables workspace operations and DML and DDL operations for all version-enabled tables on the new writer site.
- Invokes replication API procedures to relocate the master definition site to `newwritersite` for the main master group and for the master groups for all the version-enabled tables.

Examples

The following example relocates the writer site for the Workspace Manager environment to `BACKUP-SITE1` at a hypothetical company.

```
DBMS_WM.RelocateWriterSite(
    newwritersite           =>  'BACKUP-SITE1.EXAMPLE.COM'),
    oldwritersiteavailable  =>  TRUE);
```

RemoveAsParentWorkspace

Removes a workspace as a parent workspace in a multiparent workspace environment.

Syntax

```
DBMS_WM.RemoveAsParentWorkspace(
   mp_leafworkspace  IN VARCHAR2,
   parent_workspace  IN VARCHAR2,
   auto_commit       IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–52 RemoveAsParentWorkspace Procedure Parameters

Parameter	Description
mp_leaf_workspace	Name of the child workspace (multiparent leaf workspace) from which to remove parent_workspace as a parent workspace. The name is case-sensitive.
parent_workspace	Name of the workspace to remove as a parent workspace of mp_leaf_workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

This procedure is part of the support for the multiparent workspaces feature, which is described in Section 1.1.10. This procedure must be used only on a parent workspace that was previously added to the child workspace using the AddAsParentWorkspace procedure.

This procedure does not remove any workspaces. It only makes parent_workspace no longer a parent workspace of mp_leaf_workspace.

An exception is raised if one or more of the following apply:

- mp_leaf_workspace or parent_workspace does not exist.
- mp_leaf_workspace has versioned any data in parent_workspace or an ancestor of parent_workspace, and this workspace would no longer be an ancestor of mp_leaf_workspace if the operation were to be performed.
- There are any sessions with open database transactions in mp_leaf_workspace.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example removes `Workspace4` as a parent workspace of `Workspace3`. (See the hierarchy illustration in Figure 1–3 in Section 1.1.10.)

```
EXECUTE DBMS_WM.RemoveAsParentWorkspace ('Workspace3', 'Workspace4');
```

RemoveUserDefinedHint

Removes a user-defined hint: that is, causes the default optimizer hint to be used with SQL statements executed by the DBMS_WM package on a specified version-enabled table or all version-enabled tables.

Syntax

```
DBMS_WM.RemoveUserDefinedHint(
   hint_id   IN NUMBER,
   table_id  IN VARCHAR2 DEFAULT NULL);
```

Parameters

Table 4–53 RemoveUserDefinedHint Procedure Parameters

Parameter	Description
hint_id	Numeric ID that uniquely identifies the user-defined hint. Must match an existing hint ID previously specified in a call to the AddUserDefinedHint procedure.
table_id	Name of the table from which to remove the hint. The name is not case-sensitive. If this value is null and if the table_id parameter was null in the call to the AddUserDefinedHint procedure that added the hint, the hint is no longer used used with any version-enabled tables for any SQL statements that specify the hint ID. However, if this value is null and if the table_id parameter was *not* null in the call to the AddUserDefinedHint procedure that added the hint, the RemoveUserDefinedHint procedure will not remove any hints that were defined for the originally specified tables.

Usage Notes

Use this procedure only to remove or modify the effect of a user-defined hint that you previously specified using the AddUserDefinedHint procedure. (See the Usage Notes for that procedure.)

Examples

The following example removes, for the SCOTT.TABLE1 table, the user-defined hint from SQL statements associated with the hint with the hint ID 1101, and causes the default hint to be used instead.

```
EXECUTE DBMS_WM.RemoveUSerDefinedHint (1101, 'scott.table1');
```

RemoveWorkspace

Discards all row versions associated with a workspace and deletes the workspace.

Syntax

```
DBMS_WM.RemoveWorkspace(
   workspace    IN VARCHAR2,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–54 RemoveWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

The RemoveWorkspace operation can only be performed on leaf workspaces (the bottom-most workspaces in a branch in the hierarchy). For an explanation of database workspace hierarchy, see Section 1.1.1.

If the workspace being removed is a child workspace, its parent workspace is exclusively locked for the duration of the operation.

There must be no other users in the workspace being removed.

An exception is raised if the user does not have the REMOVE_WORKSPACE privilege for workspace or the REMOVE_ANY_WORKSPACE privilege, if the user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers), or if auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example removes the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.RemoveWorkspace('NEWWORKSPACE');
```

RemoveWorkspaceTree

Discards all row versions associated with a workspace and its descendant workspaces, and deletes the affected workspaces.

Syntax

```
DBMS_WM.RemoveWorkspaceTree(
   workspace    IN VARCHAR2,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–55 RemoveWorkspaceTree Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

The RemoveWorkspaceTree operation should be used with extreme caution, because it removes support structures and rolls back changes in a workspace and all its descendants down to the leaf workspace or workspaces. For example, in the hierarchy shown in Figure 1–1 in Section 1.1.1, a RemoveWorkspaceTree operation specifying Workspace1 removes Workspace1, Workspace2, and Workspace3. (For an explanation of database workspace hierarchy, see Section 1.1.1.)

There must be no other users in workspace or any of its descendant workspaces.

An exception is raised if the user does not have the REMOVE_WORKSPACE privilege for workspace or any of its descendant workspaces, if the user does not have sufficient privileges on all tables that need to be modified (including, for example, tables modified by triggers), or if auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example removes the NEWWORKSPACE workspace and all its descendant workspaces.

```
EXECUTE DBMS_WM.RemoveWorkspaceTree('NEWWORKSPACE');
```

RenameSavepoint

Renames a savepoint in a specified workspace.

Syntax

```
DBMS_WM.RenameSavepoint(
   workspace_name     IN VARCHAR2,
   savepoint_name     IN VARCHAR2;
   new_savepoint_name IN VARCHAR2;
```

Parameters

Table 4–56 RenameSavepoint Procedure Parameters

Parameter	Description
workspace_name	Name of the existing workspace in which the savepoint to be renamed exists. The name is case-sensitive.
savepoint_name	Name of the existing explicit savepoint to be renamed. (Must not be an implicit savepoint.)
new_savepoint_name	New name to be given to the savepoint. Must not be the name of an existing savepoint.

Usage Notes

An exception is raised if the user does not own the workspace or savepoint or does not have the WM_ADMIN_ROLE role.

Examples

The following example renames savepoint SP1 in the LIVE workspace to 2009 milestone.

```
EXECUTE DBMS_WM.RenameSavepoint('LIVE', 'SP11', '2009 milestone');
```

RenameWorkspace

Renames a workspace.

Syntax

```
DBMS_WM.RenameWorkspace(
   workspace_name     IN VARCHAR2,
   new_workspace_name IN VARCHAR2;
```

Parameters

Table 4–57 RenameWorkspace Procedure Parameters

Parameter	Description
workspace_name	Name of the existing workspace to be renamed. The name is case-sensitive.
new_workspace_name	New name to be given to the workspace. The new name must not be LIVE or the name of an existing workspace, and it must not contain any of the following characters: " (double quotes), ' (single quote), ` (grave accent), or | (vertical bar).

Usage Notes

This procedure automatically updates the metadata for existing version-enabled tables to refer to the new workspace name. The time required for the procedure to complete will depend on the number of version-enabled tables.

An exception is raised if the user does not own the workspace or does not have the WM_ADMIN_ROLE role.

Examples

The following example renames workspace WS1 to Construction Project.

```
EXECUTE DBMS_WM.RenameWorkspace('WS1', 'Construction Project');
```

ResolveConflicts

Resolves conflicts between workspaces.

Syntax

```
DBMS_WM.ResolveConflicts(
   workspace     IN VARCHAR2,
   table_name    IN VARCHAR2,
   where_clause  IN VARCHAR2,
   keep          IN VARCHAR2);
```

Parameters

Table 4–58 ResolveConflicts Procedure Parameters

Parameter	Description
workspace	Name of the workspace to check for conflicts with other workspaces. The name is case-sensitive.
table_name	Name of the table to check for conflicts. The name is not case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be refreshed from the parent workspace. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table.
keep	Workspace in favor of which to resolve conflicts: PARENT, CHILD, or BASE. PARENT causes the parent workspace rows to be copied to the child workspace. CHILD does not cause the child workspace rows to be copied immediately to the parent workspace. However, the conflict is considered resolved, and the child workspace rows are copied to the parent workspace when the child workspace is merged. BASE causes the base rows to be copied to the child workspace but not to the parent workspace. However, the conflict is considered resolved; and when the child workspace is merged, the base rows are copied to the parent workspace. Note that BASE is ignored for insert-insert conflicts where a base row does not exist; in this case, the keep parameter value must be PARENT or CHILD.

Usage Notes

This procedure checks the condition identified by the table_name and where_clause parameters, and it finds any conflicts between row values in workspace and its parent workspace. This procedure resolves conflicts by using the row values in the parent or child workspace, as specified in the keep parameter; however, the conflict resolution is not actually merged until you commit the transaction (standard database commit operation) and call the CommitResolve procedure to end the conflict resolution session. (For more information about conflict resolution, including an overall view of the process, see Section 1.1.4.)

For example, assume that for Department 20 (DEPARTMENT_ID = 20), the MANAGER_NAME in the LIVE and Workspace1 workspaces is Tom. Then, the following operations occur:

1. The `manager_name` for Department 20 is changed in the `LIVE` database workspace from `Tom` to `Mary`.
2. The change is committed (a standard database commit operation).
3. The `manager_name` for Department 20 is changed in `Workspace1` from `Tom` to `Franco`.
4. The MergeWorkspace procedure is called to merge `Workspace1` changes to the `LIVE` workspace.

   At this point, however, a conflict exists with respect to `MANAGER_NAME` for Department 20 in `Workspace1` (`Franco`, which conflicts with `Mary` in the `LIVE` workspace), and therefore the call to MergeWorkspace does not succeed.
5. The ResolveConflicts procedure is called with the following parameters: (`'Workspace1','department','department_id = 20','child'`).

   After the MergeWorkspace operation in step 7, the `MANAGER_NAME` value will be `Franco` in both the `Workspace1` and `LIVE` workspaces.
6. The change is committed (a standard database commit operation).
7. The MergeWorkspace procedure is called to merge `Workspace1` changes to the `LIVE` workspace.

The following considerations apply during a conflict resolution session:

- A ResolveConflicts operation prevents other workspace operations (such as a merge, refresh, or removal) on the target workspace or table until after the CommitResolve or RollbackResolve procedure is executed.
- Multiple sessions can perform ResolveConflicts operations and perform insert, update, and delete operations on the same table. However, during such operations, the target rows are locked. If more than one session attempts to perform an insert, update, or delete operation on the same row or to resolve a conflict affecting the same row, the first session is allowed to continue; and after that session executes the CommitResolve or RollbackResolve procedure, another session is allowed to proceed.

For more information about conflict resolution, see Section 1.1.4.

Examples

The following example resolves conflicts involving rows in the `DEPARTMENT` table in `Workspace1` where `DEPARTMENT_ID` is 20, and uses the values in the child workspace to resolve all such conflicts. It then merges the results of the conflict resolution by first committing the transaction (standard commit) and then calling the MergeWorkspace procedure.

```
EXECUTE DBMS_WM.BeginResolve ('Workspace1');
EXECUTE  DBMS_WM.ResolveConflicts ('Workspace1', 'department', 'department_id =
20', 'child');
COMMIT;
EXECUTE DBMS_WM.CommitResolve ('Workspace1');
```

RevokeGraphPriv

Revokes (removes) privileges on multiparent graph workspaces from users and roles for a specified leaf workspace.

Syntax

```
DBMS_WM.RevokeGraphPriv(
   priv_types      IN VARCHAR2,
   leaf_workspace  IN VARCHAR2,
   grantee         IN VARCHAR2.
   node_types      IN VARCHAR2 DEFAULT '(''R'',''I'',''L'')',
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–59 RevokeGraphPriv Procedure Parameters

Parameter	Description
priv_types	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are ACCESS_WORKSPACE, MERGE_WORKSPACE, CREATE_WORKSPACE, REMOVE_WORKSPACE, and ROLLBACK_WORKSPACE.
leaf_workspace	Name of the leaf workspace in the directed acyclic graph. (Leaf workspaces, directed acyclic graphs, and other concepts related to multiparent workspaces are explained in Section 1.1.10.) The name is case-sensitive.
grantee	Name of the user (can be the PUBLIC user group) or role from which to revoke priv_types.
node_types	List of letters (in parentheses and comma-delimited) representing the types of nodes on which to revoke the privileges: R for the root of the graph, I for the specified intermediate node, L for the leaf of the graph. The default is all types of nodes.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with RevokeWorkspacePriv, which grants workspace-level Workspace Manager privileges on workspaces other than multiparent graph workspaces.

To grant workspace-level privileges on multiparent graph workspaces, use the GrantGraphPriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You were not the grantor of priv_types to grantee.

- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example disallows user Smith from accessing all types of nodes in the directed acyclic graph in which the NEWWORKSPACE workspace is the leaf workspace and from merging changes in these workspaces.

```
EXECUTE DBMS_WM.RevokeWorkspacePriv ('ACCESS_WORKSPACE, MERGE_WORKSPACE',
'NEWWORKSPACE', 'Smith');
```

RevokeSystemPriv

Revokes (removes) system-level privileges from users and roles.

Syntax

```
DBMS_WM.RevokeSystemPriv(
   priv_types    IN VARCHAR2,
   grantee       IN VARCHAR2,
   auto_commit   IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–60 RevokeSystemPriv Procedure Parameters

Parameter	Description
priv_types	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE, CREATE_ANY_WORKSPACE, REMOVE_ANY_WORKSPACE, and ROLLBACK_ANY_WORKSPACE.
grantee	Name of the user (can be the PUBLIC user group) or role from which to revoke priv_types.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with RevokeWorkspacePriv, which revokes workspace-level Workspace Manager privileges with keywords in the form *xxx*_WORKSPACE (ACCESS_WORKSPACE, MERGE_WORKSPACE, and so on).

To grant system-level privileges, use the GrantSystemPriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You were not the grantor of priv_types to grantee.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example disallows user Smith from accessing workspaces and merging changes in workspaces.

```
EXECUTE DBMS_WM.RevokeSystemPriv ('ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE',
'Smith');
```

RevokeWorkspacePriv

Revokes (removes) workspace-level privileges from users and roles for a specified workspace.

Syntax

```
DBMS_WM.RevokeWorkspacePriv(
   priv_types   IN VARCHAR2,
   workspace    IN VARCHAR2,
   grantee      IN VARCHAR2.
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–61 RevokeWorkspacePriv Procedure Parameters

Parameter	Description
priv_types	A string of one or more keywords representing privileges. (Section 1.4 discusses Workspace Manager privileges.) Use commas to separate privilege keywords. The available keywords are ACCESS_WORKSPACE, MERGE_WORKSPACE, CREATE_WORKSPACE, REMOVE_WORKSPACE, and ROLLBACK_WORKSPACE.
workspace	Name of the workspace. The name is case-sensitive.
grantee	Name of the user (can be the PUBLIC user group) or role from which to revoke priv_types.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Contrast this procedure with RevokeSystemPriv, which revokes system-level Workspace Manager privileges with keywords in the form *xxx*_ANY_WORKSPACE (ACCESS_ANY_WORKSPACE, MERGE_ANY_WORKSPACE, and so on). Also contrast this procedure with RevokeGraphPriv, which grants workspace-level Workspace Manager privileges on multiparent graph workspaces

To grant workspace-level privileges, use the GrantWorkspacePriv procedure.

An exception is raised if one or more of the following apply:

- grantee is not a valid user or role in the database.
- You were not the grantor of priv_types to grantee.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example disallows user `Smith` from accessing the `NEWWORKSPACE` workspace and merging changes in that workspace.

```
EXECUTE DBMS_WM.RevokeWorkspacePriv ('ACCESS_WORKSPACE, MERGE_WORKSPACE',
'NEWWORKSPACE', 'Smith');
```

RollbackBulkLoading

Rolls back changes made to a version-enabled table during a bulk load operation.

Syntax

```
DBMS_WM.RollbackBulkLoading(
   table_name         IN VARCHAR2,
   ignore_last_error  IN BOOLEAN DEFAULT FALSE);
```

Parameters

Table 4–62 RollbackBulkLoading Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table into which data will be bulk loaded. The name is not case-sensitive.
ignore_last_error	A Boolean value (TRUE or FALSE). TRUE ignores the last error, if any, that occurred during the previous call to the RollbackBulkLoading procedure. Information about the last error is stored in the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views, which are described in Chapter 5. See the Usage Notes for more information. FALSE (the default) does not ignore the last error, if any, that occurred during the previous call to the RollbackBulkLoading procedure.

Usage Notes

For information about the requirements for bulk loading data into version-enabled tables, see Section 1.7.

This procedure re-creates all the views that were dropped by the BeginBulkLoading procedure.

If a call to the RollbackBulkLoading procedure fails, you should try to fix the cause of the error. Examine the USER_WM_VT_ERRORS and ALL_WM_VT_ERRORS static data dictionary views to see the SQL statement and error message. Fix the cause of the error, and then call the RollbackBulkLoading procedure again with the default ignore_last_error parameter value of FALSE. However, if the call still fails and you cannot fix the cause of the error, and if you are sure that it is safe and appropriate to ignore this error, then you have the option to ignore the error by calling the RollbackBulkLoading procedure with the ignore_last_error parameter value of TRUE. Note that you are responsible for ensuring that it is safe and appropriate to ignore the error.

An exception is raised if one or more of the following apply:

- table_name does not exist.
- table_name is not version-enabled.
- The BeginBulkLoading procedure has not been called on the table.
- The user does not own the table or does not have the WM_ADMIN_ROLE role.

Examples

The following example rolls back changes made to EMP table during a bulk load operation.

```
EXECUTE DBMS_WM.RollbackBulkLoading ('EMP');
```

RollbackDDL

Rolls back (cancels) DDL (data definition language) changes made during a DDL session for a specified table, and ends the DDL session.

Syntax

```
DBMS_WM.RollbackDDL(
   table_name  IN VARCHAR2);
```

Parameters

Table 4–63 RollbackDDL Procedure Parameters

Parameter	Description
table_name	Name of the version-enabled table. The name is not case-sensitive.

Usage Notes

This procedure rolls back (cancels) changes that were made to a version-enabled table and to any indexes and triggers based on the version-enabled table during a DDL session. It also deletes the *<table-name>_LTS* skeleton table that was created by the BeginDDL procedure.

For detailed information about performing DDL operations related to version-enabled tables, see Section 1.8; and for DDL operations on version-enabled tables in an Oracle replication environment, see also Section C.3.

An exception is raised if one or more of the following apply:

- table_name does not exist or is not version-enabled.
- An open DDL session does not exist for table_name. (That is, the BeginDDL procedure has not been called specifying this table, or the CommitDDL or RollbackDDL procedure was already called specifying this table.)

Examples

The following example begins a DDL session, adds a column named COMMENTS to the COLA_MARKETING_BUDGET table by using the skeleton table named COLA_MARKETING_BUDGET_LTS, and ends the DDL session by canceling the change.

```
EXECUTE DBMS_WM.BeginDDL('COLA_MARKETING_BUDGET');
ALTER TABLE cola_marketing_budget_lts ADD (comments VARCHAR2(100));
EXECUTE DBMS_WM.RollbackDDL('COLA_MARKETING_BUDGET');
```

RollbackResolve

Quits a conflict resolution session and discards all changes in the workspace since the BeginResolve procedure was executed.

Syntax

```
DBMS_WM.RollbackResolve(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–64 RollbackResolve Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

This procedure quits the current conflict resolution session (started by the BeginResolve procedure), and discards all changes in the workspace since the start of the conflict resolution session. Contrast this procedure with CommitResolve, which saves all changes.

While the conflict resolution session is being rolled back, the workspace is frozen in 1WRITER mode, as explained in Section 1.1.5.

For more information about conflict resolution, see Section 1.1.4.

An exception is raised if one or more of the following apply:

- There are one or more open database transactions in workspace.
- The procedure was called by a user that does not have the WM_ADMIN_ROLE role or that did not execute the BeginResolve procedure on workspace.

Examples

The following example quits the conflict resolution session in Workspace1 and discards all changes.

```
EXECUTE  DBMS_WM.RollbackResolve ('Workspace1');
```

RollbackTable

Discards all changes made in the workspace to a specified table (all rows or as specified in the WHERE clause).

Syntax

```
DBMS_WM.RollbackTable(
   workspace     IN VARCHAR2,
   table_id      IN VARCHAR2,
   sp_name       IN VARCHAR2 DEFAULT '',
   where_clause  IN VARCHAR2 DEFAULT '',
   remove_locks  IN BOOLEAN DEFAULT TRUE,
   auto_commit   IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–65 RollbackTable Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
table_id	Name of the table containing rows to be discarded. The name is not case-sensitive.
sp_name	Name of the savepoint to which to roll back. The name is case-sensitive. The default is to discard all changes (that is, ignore any savepoints).
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be discarded. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows that meet the criteria of the other parameters are discarded.
remove_locks	A Boolean value (TRUE or FALSE). TRUE (the default) releases those locks on rows in the parent workspace that satisfy the condition in the where_clause parameter and that were not versioned in the child workspace. This option has no effect if a savepoint is specified (sp_name parameter). FALSE does not release any locks in the parent workspace.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

You cannot roll back to a savepoint if any implicit savepoints were created since the specified savepoint, unless you first merge or remove the descendant workspaces that caused the implicit savepoints to be created. For example, referring to Figure 1–2 in Section 1.1.2, the user in Workspace1 cannot roll back to savepoint SP1 until

Workspace3 (which caused implicit savepoint SPc to be created) is merged or removed.

An exception is raised if one or more of the following apply:

- `workspace` does not exist.
- You do not have the privilege to roll back `workspace` or any affected table.
- A database transaction affecting `table_id` is open in any workspace.
- `auto_commit` is `TRUE` and an open transaction exists in a parent or child workspace of any table that needs to be modified.

Examples

The following example rolls back all changes made to the `EMP` table (in the `USER3` schema) in the `NEWWORKSPACE` workspace since that workspace was created.

```
EXECUTE DBMS_WM.RollbackTable ('NEWWORKSPACE', 'user3.emp');
```

RollbackToSP

Discards all data changes made in the workspace to version-enabled tables since the specified savepoint.

Syntax

```
DBMS_WM.RollbackToSP(
   workspace       IN VARCHAR2,
   savepoint_name  IN VARCHAR2,
   auto_commit     IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–66 RollbackToSP Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
savepoint_name	Name of the savepoint to which to roll back changes. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

While this procedure is executing, the workspace is frozen in NO_ACCESS mode.

Contrast this procedure with RollbackWorkspace, which rolls back all changes made since the creation of the workspace.

You cannot roll back to a savepoint if any implicit savepoints were created since the specified savepoint, unless you first merge or remove the descendant workspaces that caused the implicit savepoints to be created. For example, referring to Figure 1–2 in Section 1.1.2, the user in Workspace1 cannot roll back to savepoint SP1 until Workspace3 (which caused implicit savepoint SPc to be created) is merged or removed.

An exception is raised if one or more of the following apply:

- workspace does not exist.
- savepoint_name does not exist.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- One or more implicit savepoints were created in workspace after savepoint_name, and the descendant workspaces that caused the implicit savepoints to be created still exist.
- You do not have the privilege to roll back workspace or any affected table.

- Any sessions are in `workspace`.

Examples

The following example rolls back any changes made in the `NEWWORKSPACE` workspace to all tables since the creation of `Savepoint1`.

```
EXECUTE DBMS_WM.RollbackToSP ('NEWWORKSPACE', 'Savepoint1');
```

RollbackWorkspace

Discards all data changes made in the workspace to version-enabled tables.

Syntax

```
DBMS_WM.RollbackWorkspace(
   workspace    IN VARCHAR2,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–67 RollbackWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

Only leaf workspaces can be rolled back. That is, a workspace cannot be rolled back if it has any descendant workspaces. (For an explanation of workspace hierarchy, see Section 1.1.1.)

Contrast this procedure with RollbackToSP, which rolls back changes to a specified savepoint.

Like the RemoveWorkspace procedure, RollbackWorkspace deletes the data in the workspace; however, unlike the RemoveWorkspace procedure, RollbackWorkspace does not delete the Workspace Manager workspace structure.

While this procedure is executing, the specified workspace is frozen in NO_ACCESS mode, as explained in Section 1.1.5.

An exception is raised if one or more of the following apply:

- workspace has any descendant workspaces.
- workspace does not exist.
- auto_commit is TRUE and an open transaction exists in a parent or child workspace of any table that needs to be modified.
- You do not have the privilege to roll back workspace or any affected table.
- Any sessions are in workspace.

Examples

The following example rolls back any changes made in the NEWWORKSPACE workspace since that workspace was created.

```
EXECUTE DBMS_WM.RollbackWorkspace ('NEWWORKSPACE');
```

SetCaptureEvent

Enables or disables the capture of all Workspace Manager events or events of a specific type.

Syntax

```
DBMS_WM.SetCaptureEvent(
   event_name  IN VARCHAR2,
   capture     IN VARCHAR2 DEFAULT 'ON');
```

Parameters

Table 4–68 SetCaptureEvent Procedure Parameters

Parameter	Description
event_name	One of the following values: ALL_EVENTS, TABLE_MERGE_W_REMOVE_DATA, TABLE_MERGE_WO_REMOVE_DATA, TABLE_REFRESH, TABLE_ROLLBACK, WORKSPACE_COMPRESS, WORKSPACE_CREATE, WORKSPACE_MERGE_W_REMOVE, WORKSPACE_MERGE_WO_REMOVE, WORKSPACE_REFRESH, WORKSPACE_REMOVE, WORKSPACE_ROLLBACK, WORKSPACE_VERSION. ALL_EVENTS includes all Workspace Manager events. The other values reflect specific event types, which are listed and explained in Section 2.1.
capture	ON (the default) enables the capture of event_name events. OFF disables the capture of event_name events.

Usage Notes

For information about Workspace Manager events, see Chapter 2.

This procedure requires that the Workspace Manager system parameter ALLOW_CAPTURE_EVENTS be set to ON. To check the value of a Workspace Manager system parameter, use the GetSystemParameter procedure; to set a Workspace Manager system parameter, use the SetSystemParameter procedure.

You can use this procedure to control which types of events are captured. For example, you can enable the capture of all events, and then disable the capture of a few types of events; or you can disable the capture of all events, and then enable the capture of a few types of events.

To see which types of events are currently being captured, examine the WM_EVENTS_INFO metadata view, which is described in Section 5.46.

If this procedure completes successfully, it commits the caller's open database transaction.

An exception is raised if one or more of the following apply:

- You do not have WM_ADMIN_ROLE role.
- The value of the ALLOW_CAPTURE_EVENTS system parameter is OFF and you are trying to set event_name to ON (the default value for that parameter).
- event_name is not valid.

Examples

The following example captures all Workspace Manager events except workspace compression events, by first specifying that all events are to be captured, and then excluding workspace compression events.

```
-- Allow Workspace Manager events to be captured. (Required for SetCaptureEvent)
EXECUTE DBMS_WM.SetSystemParameter ('ALLOW_CAPTURE_EVENTS', 'ON');
-- Start capturing all Workspace Manager events.
EXECUTE DBMS_WM.SetCaptureEvent ('ALL_EVENTS','ON');
-- Exclude workspace compression events.
EXECUTE DBMS_WM.SetCaptureEvent ('WORKSPACE_COMPRESS','OFF');
```

SetCompressWorkspace

Creates rows in the WM_COMPRESSIBLE_TABLES metadata view with information about version-enabled tables that need to be compressed if workspace compression operations are performed.

Syntax

```
DBMS_WM.SetCompressWorkspace(
   workspace  IN VARCHAR2,
   firstSP    IN VARCHAR2 DEFAULT NULL,
   secondSP   IN VARCHAR2 DEFAULT NULL);
```

Parameters

Table 4–69 SetCompressWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.
firstSP	Savepoint on the first version of the compression range. Savepoint names are case-sensitive. If only workspace and firstSP are specified, all rows in version-enabled tables affected between workspace creation and firstSP are checked to see if they need to be compressed in a workspace compression operation is performed. If workspace, firstSP, and secondSP are specified, all rows in version-enabled tables affected between firstSP and secondSP are checked. If only workspace is specified (no savepoints), all rows in version-enabled tables are checked.
secondSP	Savepoint on the first version of the compression range. All rows in version-enabled tables from firstSP to secondSP are checked to see if they need to be compressed in a workspace compression operation is performed. Savepoint names are case-sensitive.

Usage Notes

You can (but do not need to) use this procedure before calling the CompressWorkspace or CompressWorkspaceTree procedure.

This procedure creates rows in the WM_COMPRESSIBLE_TABLES metadata view (described in WM_COMPRESSIBLE_TABLES) only for version-enabled tables that would need to be compressed during a workspace compression operation.

Examples

The following example creates rows in the WM_COMPRESSIBLE_TABLES metadata view for any version-enabled tables that would need to be compressed during an operation that compressed the B_focus_1 workspace.

```
EXECUTE DBMS_WM.SetCompressWorkspace ('B_focus_1');
```

SetConflictWorkspace

Determines whether or not conflicts exist between a workspace and its parent.

Syntax

```
DBMS_WM.SetConflictWorkspace(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–70 SetConflictWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

This procedure checks for any conflicts between `workspace` and its parent workspace, and it modifies the content of the <table_name>_CONF views (explained in Section 5.49) as needed.

A `SELECT` operation from the <table_name>_CONF views for all tables modified in a workspace displays all rows in the workspace that are in conflict with the parent workspace. (To obtain a list of tables that have conflicts for the current conflict workspace setting, use the SQL statement `SELECT * FROM ALL_WM_VERSIONED_TABLES WHERE conflict = 'YES';`. The SQL statement `SELECT * FROM <table_name>_CONF` displays conflicts for <table_name> between the current workspace and its parent workspace.)

Any conflicts must be resolved before a workspace can be merged or refreshed. To resolve a conflict, you must use the ResolveConflicts procedure, and then merge the result of the resolution by using the MergeWorkspace procedure.

Examples

The following example checks for any conflicts between `B_focus_2` and its parent workspace, and modifies the contents of the <table_name>_CONF views as needed.

```
EXECUTE DBMS_WM.SetConflictWorkspace ('B_focus_2');
```

SetDiffVersions

Finds differences in values in version-enabled tables for two savepoints and their common ancestor (base). It modifies the contents of the differences views that describe these differences.

Syntax

```
DBMS_WM.SetDiffVersions(
   workspace1  IN VARCHAR2,
   workspace2  IN VARCHAR2);
```

or

```
DBMS_WM.SetDiffVersions(
   workspace1  IN VARCHAR2,
   savepoint1  IN VARCHAR2,
   workspace2  IN VARCHAR2,
   savepoint2  IN VARCHAR2);
```

Parameters

Table 4–71 SetDiffVersions Procedure Parameters

Parameter	Description
`workspace1`	Name of the first workspace to be checked for differences in version-enabled tables. The name is case-sensitive.
`savepoint1`	Name of the savepoint in `workspace1` for which values are to be checked. The name is case-sensitive. If `savepoint1` and `savepoint2` are not specified, the rows in version-enabled tables for the `LATEST` savepoint in each workspace are checked. (The `LATEST` savepoint is explained in Section 1.1.2.)
`workspace2`	Name of the second workspace to be checked for differences in version-enabled tables. The name is case-sensitive.
`savepoint2`	Name of the savepoint in `workspace2` for which values are to be checked. The name is case-sensitive.

Usage Notes

This procedure modifies the contents of the differences views (*xxx*_DIFF), which are described in Section 5.50. Each call to the procedure populates one or more sets of three rows, each set consisting of:

- Values for the common ancestor
- Values for `workspace1` (`savepoint1` or `LATEST` savepoint values)
- Values for `workspace2` (`savepoint2` or `LATEST` savepoint values)

You can then select rows from the appropriate *xxx*_DIFF view or views to check comparable table values in the two savepoints and their common ancestor. The common ancestor (or *base*) is identified as `DiffBase` in *xxx*_DIFF view rows.

Examples

The following example checks the differences in version-enabled tables for the B_focus_1 and B_focus_2 workspaces. (The output has been reformatted for readability.)

```
-- Add rows to difference view: COLA_MARKETING_BUDGET_DIFF
EXECUTE DBMS_WM.SetDiffVersions ('B_focus_1', 'B_focus_2');

-- View the rows that were just added.
SELECT * from COLA_MARKETING_BUDGET_DIFF;

PRODUCT_ID  PRODUCT_NAME  MANAGER  BUDGET  WM_DIFFVER          WMCODE
----------  ------------  -------  ------  -----------         --------
       1        cola_a    Alvarez   2      DiffBase            NC
       1        cola_a    Alvarez   1.5    B_focus_1, LATEST   U
       1        cola_a    Alvarez   2      B_focus_2, LATEST   NC
       2        cola_b    Burton    2      DiffBase            NC
       2        cola_b    Beasley   3      B_focus_1, LATEST   U
       2        cola_b    Burton    2.5    B_focus_2, LATEST   U
       3        cola_c    Chen      1.5    DiffBase            NC
       3        cola_c    Chen      1      B_focus_1, LATEST   U
       3        cola_c    Chen      1.5    B_focus_2, LATEST   NC
       4        cola_d    Davis     3.5    DiffBase            NC
       4        cola_d    Davis     3      B_focus_1, LATEST   U
       4        cola_d    Davis     2.5    B_focus_2, LATEST   U

12 rows selected.
```

Section 5.50 explains how to interpret and use the information in the differences (*xxx*_DIFF) views.

SetLockingOFF

Disables Workspace Manager locking for the current session.

Syntax

```
DBMS_WM.SetLockingOFF();
```

Parameters

None.

Usage Notes

This procedure turns off Workspace Manager locking that was set on by the SetLockingON procedure. Existing locks applied by this session remain locked. All new changes by this session are not locked.

Examples

The following example sets locking off for the session.

```
EXECUTE DBMS_WM.SetLockingOFF;
```

SetLockingON

Enables Workspace Manager locking for the current session.

Syntax

```
DBMS_WM.SetLockingON(
   lockmode  IN VARCHAR2);
```

Parameters

Table 4–72 SetLockingON Procedure Parameters

Parameter	Description
lockmode	Locking mode. Must be E, WE, VE, S, or C. E (exclusive) mode locks the rows in the previous version and the corresponding rows in the current version; no other users in the workspace for either version can change any values. WE (workspace-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values in the current workspace; however, other users in other workspaces can change the values. VE (version-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values; no other users (in any workspace) can change the values. S (shared) mode locks the rows in the previous version and the corresponding rows in the current version; however, other users in the workspace for the current version (but no users in the workspace for the previous version) can change values in these rows. C (carry-forward) mode locks rows in the current workspace with the same locking mode as the corresponding rows in the previous version. (If a row is not locked in the previous version, its corresponding row in the current version is not locked.)

Usage Notes

This procedure affects Workspace Manager locking, which occurs in addition to any standard Oracle database locking. Workspace Manager locks can be used to prevent conflicts. When a user locks a row, the corresponding row in the parent workspace is also locked. Thus, when this workspace merges with the parent at merge time, it is guaranteed that this row will not have a conflict.

For information about Workspace Manager lock management, see Section 1.3.

Exclusive locking (lockmode value of E) prevents the use of *what-if* scenarios in which different values for one or more columns are tested. Thus, plan any testing of scenarios when exclusive locking is not in effect.

Locking is enabled at the user session level, and the locking mode stays in effect until any of the following occurs:

- The session goes to another workspace or connects to the database, in which case the locking mode is set to C (carry-forward) unless another locking mode has been specified using the SetWorkspaceLockModeON procedure.
- The session executes the SetLockingOFF procedure.

The locks remain in effect for the duration of the workspace, unless unlocked by the UnlockRows procedure. (Existing locks are not affected by the SetLockingOFF procedure.)

There are no specific privileges associated with locking. Any session that can go to a workspace can set locking on.

Examples

The following example sets exclusive locking on for the session.

```
EXECUTE DBMS_WM.SetLockingON ('E');
```

All rows locked by this user remain locked until the workspace is merged or rolled back.

SetMultiWorkspaces

Makes the specified workspace or workspaces visible in the multiworkspace views for version-enabled tables.

Syntax

```
DBMS_WM.SetMultiWorkspaces(
   workspaces  IN VARCHAR2);
```

Parameters

Table 4–73 SetMultiWorkspaces Procedure Parameters

Parameter	Description
workspaces	The workspace or workspaces for which information is to be added to the multiworkspace views (described in Section 5.53). The workspace names are case-sensitive. To specify more than one workspace (but no more than eight), use a comma to separate workspace names. For example: 'workspace1,workspace2'

Usage Notes

This procedure adds rows to the multiworkspace views (*xxx*_MW). See Section 5.53 for information about the contents and uses of these views.

To see the names of workspaces visible in the multiworkspace views, use the GetMultiWorkspaces function.

An exception is raised if one or more of the following apply:

- The user does not have the privilege to go to one or more of the workspaces named in workspaces.
- A workspace named in workspaces is not valid.

Examples

The following example adds information to the multiworkspace views for version-enabled tables in the B_focus_1 workspace.

```
EXECUTE DBMS_WM.SetMultiWorkspaces ('B_focus_1');
```

The following example shows the use of the SetMultiWorkspaces procedure to view information without leaving the current workspace, and the use of the GotoWorkspace procedure to view the same information.

```
-- These two pairs of statements select the same information.
EXECUTE DBMS_WM.SetMultiWorkspaces ('myworkspace');
SELECT * from mytable_mw;

EXECUTE DBMS_WM.GotoWorkspace ('myworkspace');
SELECT * from mytable;
```

To select only the rows modified in myworkspace, change the first SELECT statement in the preceding example to the following:

```
SELECT * from mytable_mw WHERE wm_modified_by = 'myworkspace';
```

The following example shows the latest rows in the combined ancestor versions of the workspaces named `myworkspace` and `yourworkspace`. If the same row is selected from more than workspace, that row is shown only once. Note that there may be more than one row for a primary key because different workspaces might be selecting different versions of the primary key.

```
EXECUTE DBMS_WM.SetMultiWorkspaces ('myworkspace,yourworkspace');
SELECT * from mytable_mw;
```

SetSystemParameter

Sets the value of a Workspace Manager system parameter.

Syntax

```
DBMS_WM.SetSystemParameter(
   name    IN VARCHAR2,
   value   IN VARCHAR2);
```

Parameters

Table 4–74 SetSystemParameter Procedure Parameters

Parameter	Description
name	Name of the Workspace Manager system parameter for which to set the value. The name must be one of the parameter names listed in Table 1–5 in Section 1.5.
value	Value for the specified Workspace Manager system parameter, as explained in Table 1–5 in Section 1.5.

Usage Notes

For information about Workspace Manager system parameters, see Section 1.5.

If this procedure completes successfully, it commits the caller's open database transaction.

An exception is raised if one or more of the following apply:

- The user does not have the WM_ADMIN_ROLE role.
- The system parameter name is not valid.
- The value is not valid for the system parameter.
- You tried to disallow capturing of events, and one or more types of events were being captured. You must first disable the capturing of all events (for example, by calling the SetCaptureEvent procedure and specifying ALL_EVENTS for event_type and OFF for capture).
- You tried to disallow multiparent workspaces, and one or more multiparent workspaces already existed. You must first ensure that all workspaces have no more than one parent workspace (for example, by calling the RemoveAsParentWorkspace procedure as needed).
- You tried to disallow nested table columns, and one or more tables with a nested table column were version-enabled. You must first disable versioning on all tables with nested table columns.
- You tried to change CR_WORKSPACE_MODE or NONCR_WORKSPACE_MODE to PESSIMISTIC_LOCKING, and data exists in a non-LIVE workspace for the corresponding type of workspace (continually refreshed or not continually refreshed).

Examples

The following example allows multiparent workspaces (described in Section 1.1.10) to be created.

```
EXECUTE DBMS_WM.SetSystemParameter ('ALLOW_MULTI_PARENT_WORKSPACES', 'ON');
```

SetTriggerEvents

Enables the execution of a trigger for a specified set of triggering events. The trigger will not be executed for events not specified

Syntax

```
DBMS_WM.SetTriggerEvents(
   triggerName    IN VARCHAR2,
   triggerEvents  IN VARCHAR2);
```

Parameters

Table 4–75 SetTriggerEvents Procedure Parameters

Parameter	Description
triggerName	Name of the trigger for which to set one or more events.
triggerEvents	A comma-delimited list of trigger event names, where each trigger event name is one of the following string constants: DBMS_WM.DML: Only for DML operations. DBMS_WM.TABLE_IMPORT: Import table (using the Import procedure). DBMS_WM.TABLE_MERGE_W_REMOVE_DATA: Merge table and remove data. DBMS_WM.TABLE_MERGE_WO_REMOVE_DATA: Merge table without removing data. DBMS_WM.WORKSPACE_MERGE_W_REMOVE: Merge workspace and remove the workspace DBMS_WM.WORKSPACE_MERGE_WO_REMOVE: Merge workspace without removing the workspace.

Usage Notes

For information about using triggers with Workspace Manager, see Section 1.10.

By default, user-defined triggers are executed for both DML and workspace events, unless the default behavior is changed by using the Workspace Manager system parameter FIRE_TRIGGERS_FOR_NONDML_EVENTS (described in Section 1.5). You can use the SetTriggerEvents procedure to override the current FIRE_TRIGGERS_FOR_NONDML_EVENTS setting for specific triggers; however, if you later change the value of the FIRE_TRIGGERS_FOR_NONDML_EVENTS system parameter, this new value overrides any setting previously specified using the SetTriggerEvents procedure.

If this procedure completes successfully, it commits the caller's open database transaction.

An exception is raised if one or more of the following apply:

- The user is not the trigger owner or does not have the WM_ADMIN_ROLE role.
- triggerName does not exist.
- one or more triggerEvents values are not valid.

Examples

The following example enables the trigger SCOTT.InsertTrigger only for DML events.

```
EXECUTE DBMS_WM.setTriggerEvents('SCOTT.InsertTrigger', DBMS_WM.DML);
```

The following example enables the trigger SCOTT.InsertTrigger for DML events and table merge operations.

```
EXECUTE DBMS_WM.setTriggerEvents('SCOTT.InsertTrigger', dbms_wm.DML || ',' ||
                         dbms_wm.TABLE_MERGE_WO_REMOVE_DATA || ',' ||
                         dbms_wm.TABLE_MERGE_W_REMOVE_DATA);
```

SetValidTime

Sets the session valid time period. (Valid time support is described in Chapter 3.)

Syntax

```
DBMS_WM.SetValidTime(
   validFrom IN TIMESTAMP WITH TIME ZONE DEFAULT DBMS_WM.CURRENT_TIME,
   validTill IN TIMESTAMP WITH TIME ZONE DEFAULT DBMS_WM.UNTIL_CHANGED);
```

Parameters

Table 4–76 SetValidTime Procedure Parameters

Parameter	Description
validFrom	The start of the session valid time period. The default value is the current timestamp value.
validTill	The end of the session valid time period. The default is that the time remains valid until the session valid time is changed.

Usage Notes

For information about Workspace Manager valid time support, see Chapter 3. Section 3.2 explains how `validFrom` and `validTill` values are interpreted.

If this procedure is not invoked in the session or if it is invoked with no parameters, all rows that are valid at the current time are considered valid, and the valid time period is considered to be from the current time forward without limit.

Examples

The following example sets the session valid time to include all of the year 2003.

```
EXECUTE DBMS_WM.SetValidTime(TO_DATE('01-01-2003', 'MM-DD-YYYY'), TO_
DATE('01-01-2004', 'MM-DD-YYYY'));
```

SetValidTimeFilterOFF

Removes the valid time filter for the current session.

Syntax

```
DBMS_WM.SetValidTimeFilterOFF();
```

Parameters

None.

Usage Notes

This procedure reverses the effect of theSetValidTimeFilterON procedure, and causes the previously defined valid time filter to be ignored for queries against tables with valid time support. Workspace Manager valid time support is explained in Chapter 3.

See also the Usage Notes for the SetValidTimeFilterON procedure.

Examples

The following example removes the valid time filter for the current session.

```
EXECUTE DBMS_WM.SetValidTimeFilterOFF;
```

SetValidTimeFilterON

Sets a valid time filter for the current session (that is, a time to be applied to version-enabled tables.

Syntax

```
DBMS_WM.SetValidTimeFilterON(
   filtertime  IN TIMESTAMP WITH TIME ZONE DEFAULT NULL);
```

Parameters

Table 4–77 SetValidTimeFilterON Procedure Parameters

Parameter	Description
`filtertime`	Date to be used as a filter when querying version-enabled tables that have valid time support. The default value is the current time; that is, each select operation on a version-enabled table with valid time support returns data that is valid as of the current time.

Usage Notes

A **valid time filter** is a time that is applied to queries against version-enabled tables that have valid time support. When a valid time filter is set for the current session, only rows that are valid for the specified time are returned. Workspace Manager valid time support is explained in Chapter 3.

The purpose for setting a valid time filter is usually to work with only one row for a given primary key value. For example, assume that for the current valid time period, the session has two rows for employee Adams: the first row is valid from 01-Mar-2004 to 30-Apr-2005, and the second row is valid from 01-May-2005 until it is changed. If you set the valid time filter to 01-Jan-2005 and select all rows for Adams, only the first row (the one valid from 01-Mar-2004 to 30-Apr-2005) is returned. If you remove the valid time filter and select all rows for Adams, both rows are returned.

The `filtertime` value must be in the valid time range for the session. You can set the valid time range using the SetValidTime procedure.

Examples

The following example sets a valid time filter so that for queries against version-enabled tables with valid time support, only rows that are valid on January 1, 2005 are returned.

```
EXECUTE DBMS_WM.SetValidTimeFilterOn(TO_DATE('2005-01-01', 'yyyy-mm-dd'));
```

SetWMValidUpdateModeOFF

Disables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support.

Syntax

```
DBMS_WM.SetWMValidUpdateModeOFF();
```

Parameters

None.

Usage Notes

This procedure disables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support. Workspace Manager valid time support is explained in Chapter 3; sequenced and nonsequenced update operations and sequenced delete operations are explained in Section 3.6.2.1.

When sequenced update and delete operations are enabled, when an update or delete operation is performed on a table with valid time support, the session's current valid time period is used so that only rows valid during that period are updated or deleted. However, calling the SetWMValidUpdateModeOFF procedure enables all row data to be updated or deleted, regardless of the valid time period, and causes WM_VALID column values in the table not to be updated. (This procedure does not affect insert or query operations on tables with valid time support.)

See also the Usage Notes for the SetWMValidUpdateModeON procedure.

Examples

The following example disables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support.

```
EXECUTE DBMS_WM.SetWMValidUpdateModeOFF;
```

SetWMValidUpdateModeON

Enables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support.

Syntax

```
DBMS_WM.SetWMValidUpdateModeON();
```

Parameters

None.

Usage Notes

This procedure enables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support. Sequenced update and delete operations are enabled when a table is version-enabled with valid time support or when valid time support is added to a version-enabled table; however, sequenced update and delete operations can be disabled using the SetWMValidUpdateModeOFF procedure.

Workspace Manager valid time support is explained in Chapter 3; sequenced and nonsequenced update operations and sequenced delete operations are explained in Section 3.6.2.2.

Examples

The following example enables sequenced and nonsequenced update operations and sequenced delete operations on tables that have valid time support. It reverses the effect of the SetWMValidUpdateModeOFF procedure.

```
EXECUTE DBMS_WM.SetWMValidUpdateModeON;
```

SetWoOverwriteOFF

Disables the VIEW_WO_OVERWRITE history option that was enabled by the EnableVersioning or SetWoOverwriteON procedure, changing the option to VIEW_W_OVERWRITE (*with overwrite*).

Syntax

```
DBMS_WM.SetWoOverwriteOFF();
```

Parameters

None.

Usage Notes

This procedure affects the recording of history information in the views named <table_name>_HIST by changing the VIEW_WO_OVERWRITE option to VIEW_W_OVERWRITE. That is, from this point forward, the views show only the most recent modifications to the same version of the table. A history of modifications to the version is not maintained; that is, subsequent changes to a row in the same version overwrite earlier changes.

This procedure affects only tables that were version-enabled with the hist parameter set to VIEW_WO_OVERWRITE in the call to the EnableVersioning procedure.

The <table_name>_HIST views are described in Section 5.51. The VIEW_WO_OVERWRITE and VIEW_W_OVERWRITE options are further described in the description of the EnableVersioning procedure.

The history option affects the behavior of the GotoDate procedure. See the Usage Notes for that procedure.

The result of the SetWoOverwriteOFF procedure remains in effect only for the duration of the current session. To reverse the effect of this procedure, use the SetWoOverwriteON procedure.

Examples

The following example disables the VIEW_WO_OVERWRITE history option.

```
EXECUTE DBMS_WM.SetWoOverwriteOFF;
```

SetWoOverwriteON

Enables the VIEW_WO_OVERWRITE history option that was disabled by the SetWoOverwriteOFF procedure.

Syntax

```
DBMS_WM.SetWoOverwriteON();
```

Parameters

None.

Usage Notes

This procedure affects the recording of history information in the views named <table_name>_HIST by changing the VIEW_W_OVERWRITE option to VIEW_WO_OVERWRITE (*without overwrite*). That is, from this point forward, the views show all modifications to the same version of the table. A history of modifications to the version is maintained; that is, subsequent changes to a row in the same version do not overwrite earlier changes.

This procedure affects only tables that were affected by a previous call to the SetWoOverwriteOFF procedure.

The <table_name>_HIST views are described in Section 5.51. The VIEW_WO_OVERWRITE and VIEW_W_OVERWRITE options are further described in the description of the EnableVersioning procedure.

The VIEW_WO_OVERWRITE history option can be overridden when a workspace is compressed by specifying the compress_view_wo_overwrite parameter as TRUE with the CompressWorkspace or CompressWorkspaceTree procedure.

The history option affects the behavior of the GotoDate procedure. See the Usage Notes for that procedure.

To reverse the effect of this procedure, use the SetWoOverwriteOFF procedure.

Examples

The following example enables the VIEW_WO_OVERWRITE history option.

```
EXECUTE DBMS_WM.SetWoOverwriteON;
```

SetWorkspaceLockModeOFF

Disables Workspace Manager locking for the specified workspace.

Syntax

```
DBMS_WM.SetWorkspaceLockModeOFF(
   workspace    IN VARCHAR2,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–78 SetWorkspaceLockModeOFF Procedure Parameters

Parameter	Description
workspace	Name of the workspace for which to set the locking mode off. The name is case-sensitive.
auto_commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

This procedure turns off Workspace Manager locking that was set on by the SetWorkspaceLockModeON procedure. Existing locks applied by this session remain locked. All new changes by this session or a subsequent session are not locked, unless the session turns locking on by executing the SetLockingON procedure.

An exception is raised if any of the following occurs:

- The user does not have the WM_ADMIN_ROLE role or is not the owner of workspace.
- auto_commit is TRUE and an open transaction exists.
- workspace is a continually refreshed workspace (see the description of the isrefreshed parameter of the CreateWorkspace procedure).

Examples

The following example sets locking off for the workspace named NEWWORKSPACE.

```
EXECUTE DBMS_WM.SetWorkspaceLockModeOFF('NEWWORKSPACE');
```

SetWorkspaceLockModeON

Enables Workspace Manager locking for the specified workspace.

Syntax

```
DBMS_WM.SetWorkspaceLockModeON(
   workspace    IN VARCHAR2,
   lockmode     IN VARCHAR2,
   override     IN BOOLEAN DEFAULT FALSE,
   auto_commit  IN BOOLEAN DEFAULT TRUE);
```

Parameters

Table 4–79 SetWorkspaceLockModeON Procedure Parameters

Parameter	Description
workspace	Name of the workspace for which to enable Workspace Manager locking. The name is case-sensitive.
lockmode	Default locking mode for row-level locking. Must be E, WE, VE, S, or C. E (exclusive) mode locks the rows in the parent workspace and the corresponding rows in the current workspace; no other users in either workspace can change any values. WE (workspace-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values in the current workspace; however, other users in other workspaces can change the values. VE (version-exclusive) mode locks the rows in the previous version and the corresponding rows in the current version such that only the user that set the lock can change the values; no other users (in any workspace) can change the values. S (shared) mode locks the rows in the parent workspace and the corresponding rows in the current workspace; however, other users in the current workspace (but no users in the parent workspace) can change values in these rows. C (carry-forward) mode locks rows in the current workspace with the same locking mode as the corresponding rows in the parent workspace. (If a row is not locked in the parent workspace, its corresponding row in the child workspace is not locked.)
override	A Boolean value (TRUE or FALSE) TRUE allows a session in the workspace to change the lockmode value by using the SetLockingON and SetLockingOFF procedures. FALSE (the default) prevents a session in the workspace from changing the lockmode value.
auto_ commit	A Boolean value (TRUE or FALSE). TRUE (the default) causes the operation to be executed as an autonomous database transaction that will be committed when it finishes. FALSE causes the operation to be executed as part of the caller's open database transaction (if one exists). If there is no open database transaction, the operation is executed in a new database transaction. In either case, the caller is responsible for committing the transaction. For more information, see Section 1.1.8.

Usage Notes

This procedure affects Workspace Manager locking, which occurs in addition to any standard Oracle database locking. Workspace Manager locks can be used to prevent conflicts. When a user locks a row, the corresponding row in the parent workspace is also locked. Thus, when this workspace merges with the parent at merge time, it is guaranteed that this row will not have a conflict.

For information about Workspace Manager lock management, see Section 1.3.

Exclusive locking (`lockmode` value of `E`) prevents the use of *what-if* scenarios in which different values for one or more columns are tested. Thus, plan any testing of scenarios when exclusive locking is not in effect.

If the override parameter value is `TRUE`, locking can also be enabled and disabled at the user session level with the SetLockingON and SetLockingOFF procedures, respectively.

All new changes by this session or a subsequent session are locked, unless the session turns locking off by executing the SetLockingOFF procedure.

This procedure requires that the user either have the `WM_ADMIN` system privilege or be the owner of the workspace. The owner of the workspace is the user that executed the procedure, not the user that has the active permissions at the time the procedure was being executed.

An exception is raised if any of the following occurs:

- The user does not have the `WM_ADMIN_ROLE` role or is not the owner of `workspace`.
- `auto_commit` is `TRUE` and an open transaction exists.
- `workspace` is a continually refreshed workspace (see the description of the `isrefreshed` parameter of the CreateWorkspace procedure).

Examples

The following example sets exclusive locking on for the workspace named `NEWWORKSPACE`.

```
EXECUTE DBMS_WM.SetWorkspaceLockModeON ('NEWWORKSPACE', 'E');
```

All locked rows remain locked until the workspace is merged or rolled back.

SynchronizeSite

Brings the local site (the old writer site) up to date in the Workspace Manager replication environment after the writer site was moved using the RelocateWriterSite procedure.

Syntax

```
DBMS_WM.SynchronizeSite(
   newwritersite  IN VARCHAR2);
```

Parameters

Table 4–80 SynchronizeSite Procedure Parameters

Parameter	Description
newwritersite	Name of the new writer site (database link) with which the local site needs to be brought up to date.

Usage Notes

To use this procedure, you must understand how replication applies to Workspace Manager objects, as explained in Appendix C. You must also understand the major Oracle replication concepts and techniques, which are documented in *Oracle Database Advanced Replication* and *Oracle Database Advanced Replication Management API Reference*.

You must execute this procedure as the replication administrator user.

You must execute this procedure on the old writer site if you specified the `oldwritersiteavailable` parameter as `FALSE` when you executed the RelocateWriterSite procedure.

Examples

The following example brings the local system up to date with the new writer site (`BACKUP-SITE1.EXAMPLE.COM`) in the Workspace Manager replication environment.

```
DBMS_WM.SynchronizeSite('BACKUP-SITE1.EXAMPLE.COM');
```

UnfreezeWorkspace

Enables access and changes to a workspace, reversing the effect of the FreezeWorkspace procedure.

Syntax

```
DBMS_WM.UnfreezeWorkspace(
   workspace  IN VARCHAR2);
```

Parameters

Table 4–81 UnfreezeWorkspace Procedure Parameters

Parameter	Description
workspace	Name of the workspace. The name is case-sensitive.

Usage Notes

The operation fails if any sessions are in workspace.

You can unfreeze a workspace only if one or more of the following apply:

- You are the owner of the specified workspace.
- You have the WM_ADMIN_ROLE, the FREEZE_ANY_WORKSPACE privilege, or the FREEZE_WORKSPACE privilege for the specified workspace.

Examples

The following example unfreezes the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.UnfreezeWorkspace ('NEWWORKSPACE');
```

UnlockRows

Enables access to versioned rows in a specified table and to corresponding rows in the parent workspace.

Syntax

```
DBMS_WM.UnlockRows(
   workspace     IN VARCHAR2,
   table_name    IN VARCHAR2,
   where_clause  IN VARCHAR2 DEFAULT '',
   all_or_user   IN VARCHAR2 DEFAULT 'USER',
   lock_mode     IN VARCHAR2 DEFAULT 'ES',
   Xmin          IN NUMBER DEFAULT NULL,
   Ymin          IN NUMBER DEFAULT NULL,
   Xmax          IN NUMBER DEFAULT NULL,
   Ymax          IN NUMBER DEFAULT NULL);
```

Parameters

Table 4–82 UnlockRows Procedure Parameters

Parameter	Description
workspace	Name of the workspace: locked rows in this workspace and corresponding rows in the parent workspace will be unlocked, as specified in the remaining parameters. The name is case-sensitive. A value of NONE can be used if lock_mode is set to VE (version-exclusive). This causes rows locked by any workspace to be unlocked.
table_name	Name of the table or (if Xmin, Ymin, Xmax, and Ymax are specified) Spatial topology in which rows are to be unlocked. The name is not case-sensitive.
where_clause	The WHERE clause (excluding the WHERE keyword) identifying the rows to be unlocked. Example: 'department_id = 20' Only primary key columns can be specified in the WHERE clause, except in a subquery. The subquery can refer to columns that are not primary keys, but it cannot refer to a version-enabled table. If the where_clause parameter is not specified, all rows in table_name are made accessible. Do not specify the where_clause parameter if table_name specifies a Spatial topology name.
all_or_user	Scope of the request: ALL or USER. ALL: All locks accessible by the user in the specified workspace are considered. USER (default): Only locks owned by the user in the specified workspace are considered.
lock_mode	Locking mode: E, WE, VE, S, or ES (default). E (exclusive): Only exclusive mode locks are considered. WE (workspace-exclusive): Only workspace-exclusive mode locks are considered. VE (version-exclusive): Only version-exclusive mode locks are considered. S (shared): Only shared mode locks are considered. ES (exclusive and shared: the default): Both exclusive mode and shared mode locks are considered.

Table 4–82 (Cont.) UnlockRows Procedure Parameters

Parameter	Description
Xmin, Ymin	For Oracle Spatial topologies only (see Section 1.14.1), the X and Y coordinate values, respectively, of the lower-left corner of the window containing the rows to be locked.You must specify these parameters if you specified a topology name for table_name; otherwise, do not specify these parameters.
Xmax, Ymax	For Oracle Spatial topologies only (see Section 1.14.1), the X and Y coordinate values, respectively, of the upper-right corner of the window containing the rows to be locked.You must specify these parameters if you specified a topology name for table_name; otherwise, do not specify these parameters.

Usage Notes

This procedure affects Workspace Manager locking, which occurs in addition to any standard Oracle database locking. For an explanation of Workspace Manager locking, see Section 1.3.

This procedure unlocks rows that were previously locked (see the LockRows procedure). It does not affect whether Workspace Manager locking is set on or off (determined by the SetLockingON and SetLockingOFF procedures).

For information about Workspace Manager locking for tables in an Oracle Spatial topology, see Section 1.14.1.

Examples

The following example unlocks the EMPLOYEES table where last_name = 'Smith' in the NEWWORKSPACE workspace.

```
EXECUTE DBMS_WM.UnlockRows ('employees', 'NEWWORKSPACE', 'last_name = ''Smith''');
```

UseDefaultValuesForNulls

Determines whether or not Workspace Manager, for the current session, uses the default value for a column when the user either specifies a null value or does not specify any value for the column in an insert operation on a version-enabled table.

Syntax

```
DBMS_WM.UseDefaultValuesForNulls(
   mode_var IN VARCHAR2);
```

Parameters

Table 4–83 UseDefaultValuesForNulls Procedure Parameters

Parameter	Description
mode_var	Mode for handling the insertion of null values: OFF or ON. OFF: A null value is inserted into the column. (This is the normal Oracle behavior.) ON: The default value for the column is inserted into the column.

Usage Notes

This procedure affects what Workspace Manager does only if an INSERT statement into a version-enabled table explicitly specifies NULL for a column when the column has been defined as having a default value or leaves the column unspecified. For example, assume the following table definition:

```
CREATE TABLE players (name VARCHAR2(20), rating NUMBER DEFAULT 10);
```

If the PLAYERS table is version-enabled and if you have not executed this procedure with a mode_var parameter value of OFF, the following statement inserts a row for Smith with a null RATING value:

If the PLAYERS table is version-enabled and if you have executed this procedure with a mode_var parameter value of OFF, either of the following statements would insert a row for Smith with a null RATING value

```
INSERT INTO players VALUES ('Smith', NULL);
INSERT INTO players(name) VALUES ('Smith');
```

However, if you have executed the UseDefaultValuesForNulls procedure with a mode_var parameter value of ON, both statements insert a row for Smith with a RATING value of 10. If this procedure is not executed in a session, the default behavior is the same as if mode_var was specified as ON.

If the INSERT statement does not specify a value for a column that has a default value, the default value is inserted regardless of whether or not you previously called the UseDefaultValuesForNulls procedure or what the mode_var parameter value was. For example, the following statement always inserts a row for Smith with a RATING value of 10:

```
INSERT INTO players VALUES ('Smith');
```

Examples

The following example causes the column default value to be used during the rest of the current session whenever an INSERT statement into a version-enabled table specifies a null value for a column that has a default value or the column is left unspecified.

```
EXECUTE DBMS_WM.UseDefaultValuesForNulls('ON');
```

5

Workspace Manager Static Data Dictionary Views

Workspace Manager creates and maintains static data dictionary views to hold information about such things as version-enabled tables, workspaces, savepoints, users, privileges, locks, and conflicts. These views are read-only to users. You can use the information in these views to help administer the Workspace Manager environment and diagnose problems.

There are also views created for each version-enabled table, as follows:

- Conflict view, each having a name in the form <table_name>_CONF. (See Section 5.49.)
- Difference view, each having a name in the form <table_name>_DIFF. (See Section 5.50.)
- History view (if history tracking is enabled), each having a name in the form <table_name>_HIST. (See Section 5.51.)
- Lock view, each having a name in the form <table_name>_LOCK. (See Section 5.52.)
- Multiworkspace view, each having a name in the form <table_name>_MW. (See Section 5.53.)

5.1 ALL_MP_GRAPH_WORKSPACES

ALL_MP_GRAPH_WORKSPACES contains information about multiparent graph workspaces (explained in Section 1.1.10) for which the leaf workspace can be accessed by the current user.

Related View

- USER_MP_GRAPH_WORKSPACES (Section 5.27) contains information about multiparent graph workspaces for which the leaf workspace is owned by the current user.

Column	Datatype	Null?	Description
MP_LEAF_WORKSPACE	VARCHAR2(30)	NOT NULL	Name of the multiparent leaf workspace.
GRAPH_WORKSPACE	VARCHAR2(30)	NOT NULL	Name of the multiparent graph workspace.

Column	Datatype	Null?	Description
GRAPH_FLAG	VARCHAR2(22)		L if the multiparent graph workspace is the leaf workspace in the multiparent graph; I if the multiparent graph workspace is an intermediate workspace in the multiparent graph; R if the multiparent graph workspace is the root workspace in the multiparent graph.

5.2 ALL_MP_PARENT_WORKSPACES

ALL_MP_PARENT_WORKSPACES contains information about parent workspaces of multiparent workspaces (explained in Section 1.1.10) that the current user can access.

Related View

- USER_MP_PARENT_WORKSPACES (Section 5.28) contains information about parent workspaces of multiparent workspaces that the current user owns.

Column	Datatype	Null?	Description
MP_LEAF_WORKSPACE	VARCHAR2(30)	NOT NULL	Name of the multiparent leaf workspace.
PARENT_WORKSPACE	VARCHAR2(30)	NOT NULL	Name of the parent workspace.
CREATOR	VARCHAR2(30)		Name of the user that made PARENT_WORKSPACE a parent workspace of MP_LEAF_WORKSPACE.
CREATETIME	DATE		Date and time when PARENT_WORKSPACE became a parent workspace of MP_LEAF_WORKSPACE.
ISREFRESHED	VARCHAR2(3)		YES if the multiparent leaf workspace is a continually refreshed workspace; NO if the multiparent leaf workspace is not a continually refreshed workspace.
PARENT_FLAG	VARCHAR2(17)		DP if PARENT_WORKSPACE is the default parent of MP_LEAF_WORKSPACE; MP if PARENT_WORKSPACE was added as a parent of MP_LEAF_WORKSPACE.

5.3 ALL_REMOVED_WORKSPACES

ALL_REMOVED_WORKSPACES contains information about workspaces, that the current user has access to, that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the remove_workspace parameter value was true, and while the value of the Workspace Manager system parameter KEEP_REMOVED_WORKSPACES_INFO was ON. (This system parameter is described in Section 1.5.)

Related Views

- USER_REMOVED_WORKSPACES (Section 5.29) contains information about workspaces, that the current user owns, that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the remove_workspace parameter value was true, and while the value of the Workspace Manager system parameter KEEP_REMOVED_WORKSPACES_INFO was ON.
- ALL_REMOVED_WORKSPACES (Section 5.3) contains information about workspaces that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the remove_workspace parameter value

was true, and while the value of the Workspace Manager system parameter KEEP_REMOVED_WORKSPACES_INFO was ON.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)		User name of the owner of the removed workspace.
WORKSPACE_NAME	VARCHAR2(30)		Name of the removed workspace.
WORKSPACE_ID	NUMBER(38)	NOT NULL	ID of the removed workspace.
PARENT_WORKSPACE_NAME	VARCHAR2(30)		Name of the parent workspace of the removed workspace.
PARENT_WORKSPACE_ID	NUMBER(38)		ID of the parent workspace of the removed workspace.
CREATETIME	DATE		Date and time when the removed workspace was created.
RETIRETIME	DATE		Date and time when the removed workspace was removed.
DESCRIPTION	VARCHAR2(1000)		Description of the removed workspace.
MP_ROOT_WORKSPACE_ID	NUMBER(38)		ID of the root workspace of the multiparent graph; null if the workspace is not part of a multiparent graph. (Multiparent workspaces are explained in Section 1.1.10.)
CONTINUALLY_REFRESHED	VARCHAR2(3)		YES if the workspace is continually refreshed (see the description of the isrefreshed parameter of the CreateWorkspace procedure); NO if the workspace is not continually refreshed.

5.4 ALL_VERSION_HVIEW

ALL_VERSION_HVIEW contains information about the version hierarchy. It is used by Workspace Manager to perform queries against the *xxx*_HIST views (described in Section 5.51).

Column	Datatype	Null?	Description
VERSION	NUMBER(38)	NOT NULL	Version number of the workspace identified in the WORKSPACE column.
PARENT_VERSION	NUMBER(38)		Version number of the parent version of the version identified in the VERSION column.
WORKSPACE	VARCHAR2(30)		Name of the workspace associated with the version number in the VERSION column.

5.5 ALL_WM_CONS_COLUMNS

ALL_WM_CONS_COLUMNS contains information about columns in unique constraints on version-enabled tables on which the current user has one or more of the following privileges: SELECT, INSERT, UPDATE, or DELETE.

Related View

- USER_WM_CONS_COLUMNS (Section 5.30) contains information about columns in unique constraints on version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)		User name of the constraint owner.

Column	Datatype	Null?	Description
CONSTRAINT_NAME	VARCHAR2(30)		Name of the constraint.
TABLE_NAME	VARCHAR2(30)		Name of the version-enabled table on which the constraint is defined.
COLUMN_NAME	VARCHAR2(4000)		Column in the constraint definition.
POSITION	NUMBER		Position of the column in the constraint.

5.6 ALL_WM_CONSTRAINTS

ALL_WM_CONSTRAINTS contains information about constraints on version-enabled tables on which the current user has one or more of the following privileges: SELECT, INSERT, UPDATE, or DELETE. It provides information about the following kinds of constraints: UNIQUE constraint, unique index, PRIMARY KEY constraints, and CHECK constraints.

Related View

- USER_WM_CONSTRAINTS (Section 5.31) contains information about constraints on version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)	NOT NULL	User name of the constraint owner. (Same as the owner of TABLE_NAME.)
CONSTRAINT_NAME	VARCHAR2(30)		Name of the constraint.
CONSTRAINT_TYPE	VARCHAR2(2)		One of the following values: P = primary constraint, PU = primary constraint enforced using unique index, PN = primary constraint enforced using non-unique index, U = unique constraint, UU = unique constraint enforced using unique index, UN = unique constraint enforced using non-unique index, UI = unique index.
TABLE_NAME	VARCHAR2(30)		Name of the table on which the constraint is defined.
SEARCH_CONDITION	CLOB		Condition for checking the constraint.
STATUS	VARCHAR2(8)		ENABLED if the constraint is enabled; DISABLED if the constraint is disabled.
INDEX_OWNER	VARCHAR2(30)		Owner of the index used for enforcing the constraint.
INDEX_NAME	VARCHAR2(30)		Name of the index used for enforcing the constraint.
INDEX_TYPE	VARCHAR2(40)		NORMAL if the index is not a function-based index; FUNCTION-BASED NORMAL for a function-based index.

5.7 ALL_WM_IND_COLUMNS

ALL_WM_IND_COLUMNS contains information about indexes used for enforcing unique constraints on version-enabled tables on which the current user has one or more of the following privileges: SELECT, INSERT, UPDATE, or DELETE.

Related View

- USER_WM_IND_COLUMNS (Section 5.32) contains information about indexes used for enforcing unique constraints on version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
INDEX_OWNER	VARCHAR2(30)		User name of the index owner.
INDEX_NAME	VARCHAR2(30)		Name of the index.
OWNER	VARCHAR2(30)		User name of the owner of the version-enabled table on which the index is defined.
TABLE_NAME	VARCHAR2(30)		Name of the version-enabled table on which the index is defined.
COLUMN_NAME	VARCHAR2(4000)		Column on which the index is defined.
COLUMN_POSITION	NUMBER		Position of the column in the index.
COLUMN_LENGTH	NUMBER		Length of the column.
DESCEND	VARCHAR2(4)		ASC if the column data in the index is in ascending order; DESC if the column data in the index is in descending order.

5.8 ALL_WM_IND_EXPRESSIONS

ALL_WM_IND_EXPRESSIONS contains information about functional expressions on functional unique indexes on version-enabled tables on which the current user has one or more of the following privileges: SELECT, INSERT, UPDATE, or DELETE.

Related View

- USER_WM_IND_EXPRESSIONS (Section 5.33) contains information about functional expressions on functional unique indexes on version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
INDEX_OWNER	VARCHAR2(30)		User name of the index owner.
INDEX_NAME	VARCHAR2(30)		Name of the index.
OWNER	VARCHAR2(30)		User name of the owner of the version-enabled table on which the index is defined.
TABLE_NAME	VARCHAR2(30)		Name of the version-enabled table on which the index is defined.
COLUMN_EXPRESSION	VARCHAR2(4000)		Test of the functional expression on which the index is defined.
COLUMN_POSITION	NUMBER		Position of the expression in the index.

5.9 ALL_WM_LOCKED_TABLES

ALL_WM_LOCKED_TABLES contains information about Workspace Manager locks on rows in version-enabled tables that the current user can access.

Related View

- USER_WM_LOCKED_TABLES (Section 5.34) contains information about Workspace Manager locks on rows in version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
TABLE_OWNER	VARCHAR2(40)		User name of the table owner.

Column	Datatype	Null?	Description
TABLE_NAME	VARCHAR2(40)		Name of the table.
LOCK_MODE	VARCHAR2(9)		Type of lock: EXCLUSIVE or SHARED.
LOCK_OWNER	VARCHAR2(4000)		User name of the owner of the lock.
LOCKING_STATE	VARCHAR2(4000)		Workspace in which the lock was placed.

5.10 ALL_WM_MODIFIED_TABLES

ALL_WM_MODIFIED_TABLES contains information about all version-enabled tables that have been modified and on which the current user has one or more of the following privileges: SELECT, INSERT, DELETE, UPDATE.

Related View

- USER_WM_MODIFIED_TABLES (Section 5.35) contains information about version-enabled tables that have been modified and that the current user owns.

Column	Datatype	Null?	Description
TABLE_NAME	VARCHAR2(61)		Name of a version-enabled table.
WORKSPACE	VARCHAR2(30)	NOT NULL	Workspace in which the modification occurred.
SAVEPOINT	VARCHAR2(30)		Name of the savepoint associated with the most recent modification, or LATEST if a savepoint does not yet exist is the workspace.

5.11 ALL_WM_RIC_INFO

ALL_WM_RIC_INFO contains information about referential integrity constraints in version-enabled tables that the current user can access. Workspace Manager uses this information to provide referential integrity support, which is described in Section 1.9.1.

Related View

- USER_WM_RIC_INFO (Section 5.37) contains information about referential integrity constraints in version-enabled tables that the current user owns.

Column	Datatype	Null?	Description
CT_OWNER	VARCHAR2(40)	NOT NULL	Owner of the child table in the referential integrity constraint.
CT_NAME	VARCHAR2(40)		Name of the child table in the referential integrity constraint.
PT_OWNER	VARCHAR2(40)		Owner of the parent table in the referential integrity constraint.
PT_NAME	VARCHAR2(40)		Name of the parent table in the referential integrity constraint.
RIC_NAME	VARCHAR2(40)	NOT NULL	Name of the referential integrity constraint.
CT_COLS	VARCHAR2(4000)		List of foreign key columns in the child table in the referential integrity constraint.

Column	Datatype	Null?	Description
PT_COLS	VARCHAR2(4000)		List of foreign key columns in the parent table in the referential integrity constraint.
R_CONSTRAINT_NAME	VARCHAR2(40)		Name of the unique constraint defined on the parent table in the referential integrity constraint.
DELETE_RULE	VARCHAR2(2)		Rule to apply when deletion occurs in the parent table. C (Cascade) causes related child table rows to be deleted; N (Set Null) causes the foreign key of related child table rows to be set to null; R (Restrict) prevents the deletion if any related child table rows exist.
STATUS	VARCHAR2(8)		ENABLED if the referential integrity constraint is enabled; DISABLED if the referential integrity constraint is disabled.

5.12 ALL_WM_TAB_TRIGGERS

ALL_WM_TAB_TRIGGERS contains information about triggers that the current user created and for version-enabled tables owned by the current user that have triggers defined on them. If the current user has the CREATE ANY TRIGGER privilege, trigger information is displayed for all version-enabled tables.

Related View

- USER_WM_TAB_TRIGGERS (Section 5.38) contains information about triggers that are owned by the current user and that are on version-enabled tables.

Column	Datatype	Null?	Description
TRIGGER_OWNER	VARCHAR2(50)	NOT NULL	Owner (schema) of the trigger.
TRIGGER_NAME	VARCHAR2(50)	NOT NULL	Name of the trigger.
TABLE_OWNER	VARCHAR2(50)		Owner (schema) of the table on which the trigger is defined.
TABLE_NAME	VARCHAR2(50)		Name of the table on which the trigger is defined.
TRIGGER_TYPE	VARCHAR2(3)		Trigger type: one of the codes described following this table.
STATUS	VARCHAR2(10)		ENABLED if the trigger is enabled; DISABLED if the trigger is disabled.
WHEN_CLAUSE	VARCHAR2(4000)		Clause that must evaluate to TRUE for the trigger body (TRIGGER_BODY) to execute.
DESCRIPTION	VARCHAR2(4000)		Description of the trigger. Useful if the trigger must be re-created.
TRIGGER_BODY	CLOB		Statements executed by the trigger.
TAB_MERGE_WO_ REMOVE	VARCHAR2(4)		ON if DBMS_WM.TABLE_MERGE_WO_REMOVE_DATA has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.TABLE_MERGE_WO_REMOVE_DATA has not been set.
TAB_MERGE_W_ REMOVE	VARCHAR2(4)		ON if DBMS_WM.TABLE_MERGE_W_REMOVE_DATA has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.TABLE_MERGE_W_REMOVE_DATA has not been set.

Column	Datatype	Null?	Description
WSPC_MERGE_WO_REMOVE	VARCHAR2(4)		ON if DBMS_WM.WORKSPACE_MERGE_WO_REMOVE_DATA has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.WORKSPACE_MERGE_WO_REMOVE_DATA has not been set.
WSPC_MERGE_W_REMOVE	VARCHAR2(4)		ON if DBMS_WM.WORKSPACE_MERGE_W_REMOVE_DATA has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.WORKSPACE_MERGE_W_REMOVE_DATA has not been set.
DML	VARCHAR2(4)		ON if DBMS_WM.DML has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.DML has not been set.
TABLE_IMPORT	VARCHAR2(4)		ON if DBMS_WM.TABLE_IMPORT has been set (see the SetTriggerEvents procedure), or OFF if DBMS_WM.TABLE_IMPORT has not been set.

TRIGGER_TYPE is one of the following values:

- BIR: before insert for each row
- AIR: after insert for each row
- BUR: before update for each row
- AUR: after update for each row
- BDR: before delete for each row
- ADR: after delete for each row
- BIS: before insert for each statement
- AIS: after insert for each statement
- BUS: before update for each statement
- AUS: after update for each statement
- BDS: before delete for each statement
- ADS: after delete for each statement

5.13 ALL_WM_VERSIONED_TABLES

ALL_WM_VERSIONED_TABLES contains information about all version-enabled tables on which the current user has one or more of the following privileges: SELECT, INSERT, DELETE, UPDATE.

Related Views

- USER_WM_VERSIONED_TABLES (Section 5.39) contains information about version-enabled tables that the current user owns.
- DBA_WM_VERSIONED_TABLES (Section 5.20) contains information about all version-enabled tables.

Column	Datatype	Null?	Description
TABLE_NAME	VARCHAR2(30)	NOT NULL	Name of a version-enabled table.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)	NOT NULL	Owner (schema) of the table.
STATE	VARCHAR2(13)		State of the table: one of the values described following this table.
HISTORY	VARCHAR2(50)		History option for the table: NONE, VIEW_W_OVERWRITE, or VIEW_WO_OVERWRITE. (For an explanation of the history option values, see the information about the EnableVersioning procedure in Chapter 4.)
NOTIFICATION	VARCHAR2(3)		(Not used for this release.)
NOTIFYWORKSPACES	VARCHAR2(3999)		(Not used for this release.)
CONFLICT	VARCHAR2(4000)		YES if there are any conflicts on the table between the workspace that performed the SetConflictWorkspace operation and its parent workspace; otherwise, NO.
DIFF	VARCHAR2(4000)		YES if there are any differences for this table as a result of a SetDiffVersions operation; otherwise, NO.
VALIDTIME	VARCHAR2(3)		YES if valid time is enabled on the table; otherwise, NO.

STATE is one of the following values:

- VERSIONED: The table has been version-enabled.
- DV: The table is being version-disabled.
- EV: The table is being version-enabled.
- DDL: The table is active in a DDL session.
- BDDL: The BeginDDL procedure is being performed on the table.
- CDDL: The CommitDDL procedure is being performed on the table.
- LWDV: The table is being lightweight version-disabled (an internal operation).
- LWEV: The table is being lightweight version-enabled (an internal operation).
- LW_DISABLED: The table has been lightweight version-disabled (an internal operation).

- ADD_VT: The AlterVersionedTable procedure (with the alter_option parameter set to 'ADD_VALID_TIME') is being performed on this table.
- AVTDDL: The AlterVersionedTable procedure is being performed on this table.
- BDDL: The BeginDDL procedure is being performed on the table.
- BL_F_BEGIN: The CommitBulkLoading procedure is being performed on this table.
- BL_P_BEGIN: The BeginBulkLoading procedure is being performed on this table.
- BL_P_END: The table is active in a bulk loading session.
- BL_R_BEGIN: The RollbackBulkLoading procedure is being performed on this table.
- CDDL: The CommitDDL procedure is being performed on the table.
- D_HIST_COLS: The columns of the table version-enabled are being downgraded.

- DDL: The table is active in a DDL session.
- DV: The table is being version-disabled.
- EV: The table is being version-enabled.
- LW_DISABLED: The table has been lightweight version-disabled (an internal operation).
- LWDV: The table is being lightweight version-disabled (an internal operation).
- LWEV: The table is being lightweight version-enabled (an internal operation).
- RB_IND: The AlterVersionedTable procedure (with the alter_option parameter set to 'REBUILD_INDEX') is being performed on this table.
- RN_CONS: The AlterVersionedTable procedure (with the alter_option parameter set to 'RENAME_CONSTRAINT') is being performed on this table.
- RN_IND: The AlterVersionedTable procedure (with the alter_option parameter set to 'RENAME_INDEX') is being performed on this table.
- SYNCVTV1: The AlterVersionedTable procedure (with the alter_option parameter set to 'USE_WM_PERIOD_FOR_VALIDTIME') is being performed on this table.
- SYNCVTV2: The AlterVersionedTable procedure (with the alter_option parameter set to 'USE_SCALAR_TYPES_FOR_VALIDTIME') is being performed on this table.
- TDDL: The Add_Topo_Geometry_Layer procedure is being performed on this table.
- U_HIST_COLS: The columns of the table version-enabled are being upgraded.
- VERSIONED: The table has been version-enabled.

5.14 ALL_WM_VT_ERRORS

ALL_WM_VT_ERRORS contains information about the error that occurred during the last call to the DisableVersioning or CommitDDL procedure that specified a table on which the current user has one or more of the following privileges: SELECT, INSERT, DELETE, UPDATE.

Related View

- USER_WM_VT_ERRORS (Section 5.40) contains information about the error that occurred during the last call to the DisableVersioning or CommitDDL procedure that specified a table that the current user owns and on which the current user has one or more of the following privileges: SELECT, INSERT, DELETE, UPDATE.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)	NOT NULL	Owner (schema) of the table.
TABLE_NAME	VARCHAR2(30)	NOT NULL	Name of a version-enabled table.
STATE	VARCHAR2(13)		State of the table. For example, VERSIONED means that the table is version-enabled, and DV means that the table is being version-disabled.
SQL_STR	VARCHAR2(4000)		The SQL statement that failed during the processing of the DisableVersioning or CommitDDL procedure.

Column	Datatype	Null?	Description
STATUS	VARCHAR2(100)		Information about the state of the SQL statement that failed during the processing of the DisableVersioning or CommitDDL procedure.
ERROR_MSG	VARCHAR2(200)		Error message caused by the SQL statement that failed during the processing of the DisableVersioning or CommitDDL procedure.

5.15 ALL_WORKSPACE_PRIVS

ALL_WORKSPACE_PRIVS contains information about Workspace Manager privileges in all workspaces that the current user can access.

Related Views

- USER_WORKSPACE_PRIVS (Section 5.41) contains information about Workspace Manager privileges in workspaces created by the current user.
- DBA_WORKSPACE_PRIVS (Section 5.22) contains information about Workspace Manager privileges in all workspaces.

Column	Datatype	Null?	Description
GRANTEE	VARCHAR2(30)		User or role to which the privilege was granted.
WORKSPACE	VARCHAR2(30)		Name of the workspace.
PRIVILEGE	VARCHAR2(22)		Name of the Workspace Manager privilege.
GRANTOR	VARCHAR2(30)		User or role that granted the privilege.
GRANTABLE	VARCHAR2(3)		YES if grantee was given the grant option (that is, can grant the privilege to other users); NO if grantee was not given the grant option.

5.16 ALL_WORKSPACE_SAVEPOINTS

ALL_WORKSPACE_SAVEPOINTS contains information about savepoints in all workspaces that the current user can access.

Related Views

- USER_WORKSPACE_SAVEPOINTS (Section 5.42) contains information about savepoints in workspaces created by the current user.
- DBA_WORKSPACE_SAVEPOINTS (Section 5.23) contains information about savepoints in all workspaces.

Column	Datatype	Null?	Description
SAVEPOINT	VARCHAR2(30)	NOT NULL	Name of the savepoint. Explicit savepoints are named by users; implicit savepoints are named by Workspace Manager.
WORKSPACE	VARCHAR2(30)	NOT NULL	Workspace in which the savepoint was created.
IMPLICIT	VARCHAR2(3)		YES if the savepoint is implicit (that is, was created automatically by Workspace Manager); NO if the savepoint is explicit (that is, was created by a user).
POSITION	NUMBER(38)		Position of the savepoint in the sequence in which savepoints were created.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)		Name of the user that created the savepoint.
CREATETIME	DATE		Date and time that the savepoint was created.
DESCRIPTION	VARCHAR2(1000)		Description of the savepoint.
CANROLLBACKTO	VARCHAR2(3)		YES if the savepoint can be rolled back to; NO if the savepoint cannot be rolled back to. In a RollbackToSP operation, if any implicit savepoints have greater POSITION values than the position of the savepoint to be rolled back to, you must first merge or remove the workspaces that caused these intervening implicit savepoints to be created.
REMOVABLE	VARCHAR2(3)		YES if the savepoint can be removed; NO if the savepoint cannot be removed. An implicit savepoint cannot be removed if it has any child dependencies; all other implicit savepoints and all explicit savepoints can be removed.

5.17 ALL_WORKSPACES

ALL_WORKSPACES contains information about all workspaces that the current user can access.

Its columns are the same as those for the DBA_WORKSPACES view, except for the following:

- ALL_WORKSPACES includes the following columns that are not in DBA_WORKSPACES: CONTINUALLY_REFRESHED, WORKSPACE_LOCKMODE, and WORKSPACE_LOCKMODE_OVERRIDE.
- DBA_WORKSPACES includes the following columns that are not in ALL_WORKSPACES: SID and SERIAL#.

Related Views

- DBA_WORKSPACES (Section 5.25) contains information about all workspaces. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.
- USER_WORKSPACES (Section 5.43) contains information about workspaces created by the current user.

Column	Datatype	Null?	Description
WORKSPACE	VARCHAR2(30)		Name of the workspace.
WORKSPACE_ID	NUMBER(38)		ID of the workspace.
PARENT_WORKSPACE	VARCHAR2(30)		Parent workspace of this workspace.
PARENT_SAVEPOINT	VARCHAR2(30)		Implicit savepoint that was created in the parent workspace when this workspace was created.
OWNER	VARCHAR2(30)		Name of the user that created the workspace.
CREATETIME	DATE		Date and time that the workspace was created.
DESCRIPTION	VARCHAR2(1000)		Description of the workspace.
FREEZE_STATUS	VARCHAR2(8)		FROZEN if the workspace is frozen (by a FreezeWorkspace operation); UNFROZEN if the workspace is not frozen.

Column	Datatype	Null?	Description
FREEZE_MODE	VARCHAR2(20)		NO_ACCESS, READ_ONLY, 1WRITER, or 1WRITER_SESSION. See the freezemode parameter description for the FreezeWorkspace procedure in Chapter 4.
FREEZE_WRITER	VARCHAR2(30)		The user allowed to make changes in the workspace; or null if the workspace is not frozen or if it is frozen in NO_ACCESS or READ_ONLY mode. See the freezewriter parameter description for the FreezeWorkspace procedure in Chapter 4.
FREEZE_OWNER	VARCHAR2(30)		Name of the user that froze the workspace.
SESSION_DURATION	VARCHAR2(3)		YES if the workspace is frozen only for the duration of the current session; NO if the workspace is frozen until an explicit UnfreezeWorkspace procedure call is made; null if the workspace is not currently frozen.
CURRENT_SESSION	VARCHAR2(3)		YES if the current session is allowed to make changes in the workspace; NO if the current session is not allowed to make changes in the workspace; null if the workspace is not currently frozen in session_duration mode.
RESOLVE_STATUS	VARCHAR2(8)		ACTIVE if a conflict resolution session is in progress; INACTIVE if a conflict resolution session is not in progress.
RESOLVE_USER	VARCHAR2(30)		Name of the user that started the conflict resolution session if resolve_status is ACTIVE; otherwise, null.
CONTINUALLY_REFRESHED	VARCHAR2(3)		YES if the workspace is continually refreshed (see the description of the isrefreshed parameter of the CreateWorkspace procedure); NO if the workspace is not continually refreshed.
WORKSPACE_LOCKMODE	VARCHAR2(19)		EXCLUSIVE if the locking mode is exclusive; SHARED is the locking mode is shared; CARRY if the locking mode is carry-forward. See the lockmode parameter description for the SetWorkspaceLockModeON procedure in Chapter 4.
WORKSPACE_LOCKMODE_OVERRIDE	VARCHAR2(3)		YES if the override option is TRUE; NO if the override option is FALSE; null if the workspace lock mode is not set. See the override parameter description for the SetWorkspaceLockModeON procedure in Chapter 4.
MP_ROOT_WORKSPACE	VARCHAR2(30)		Name of the root workspace of the multiparent graph; null if the workspace is not part of a multiparent graph. (Multiparent workspaces are explained in Section 1.1.10.)

5.18 DBA_REMOVED_WORKSPACES

DBA_REMOVED_WORKSPACES contains information about workspaces that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the remove_workspace parameter value was true, and while the value of the Workspace Manager system parameter KEEP_REMOVED_WORKSPACES_INFO was ON. (This system parameter is described in Section 1.5.) Its columns are the same as those in ALL_REMOVED_WORKSPACES in Section 5.3. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

5.19 DBA_WM_SYS_PRIVS

DBA_WM_SYS_PRIVS contains information about all users that have Workspace Manager system-level privileges (that is, privilege names containing *_ANY_WORKSPACE*, as explained in Section 1.4). This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

Column	Datatype	Null?	Description
GRANTEE	VARCHAR2(30)		User or role to which the system-level privilege was granted.
PRIVILEGE	VARCHAR2(22)		Name of the Workspace Manager system-level privilege.
GRANTOR	VARCHAR2(30)		User or role that granted the system-level privilege.
GRANTABLE	VARCHAR2(3)		YES if grantee was given the grant option (that is, can grant the privilege to other users); NO if grantee was not given the grant option.

5.20 DBA_WM_VERSIONED_TABLES

DBA_WM_VERSIONED_TABLES contains information about all version-enabled tables. Its columns are the same as those in ALL_WM_VERSIONED_TABLES in Section 5.13. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

5.21 DBA_WM_VT_ERRORS

DBA_WM_VT_ERRORS contains information about the error that occurred during the last call to the DisableVersioning, CommitDDL, or RecoverFromDroppedUser procedure. Its columns are the same as those in ALL_WM_VT_ERRORS in Section 5.14. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

5.22 DBA_WORKSPACE_PRIVS

DBA_WORKSPACE_PRIVS contains information about Workspace Manager privileges in all workspaces. Its columns are the same as those in ALL_WORKSPACE_PRIVS in Section 5.15. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

5.23 DBA_WORKSPACE_SAVEPOINTS

DBA_WORKSPACE_SAVEPOINTS contains information about savepoints in all workspaces. Its columns are the same as those in ALL_WORKSPACE_SAVEPOINTS in Section 5.16. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

5.24 DBA_WORKSPACE_SESSIONS

DBA_WORKSPACE_SESSIONS contains information about all users and workspaces (except for the LIVE workspace). This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role. It is useful for monitoring users in the different workspaces.

Column	Datatype	Null?	Description
USERNAME	VARCHAR2(30)		User name.
WORKSPACE	VARCHAR2(30)	NOT NULL	Workspace that the user is currently in.
SID	NUMBER		Session ID.
STATUS	VARCHAR2(8)		ACTIVE if the user currently has an open transaction (that is, a database transaction); INACTIVE if the user does not have an open transaction.

5.25 DBA_WORKSPACES

DBA_WORKSPACES contains information about all workspaces. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

Its columns are the same as those for the ALL_WORKSPACES view, except for the following:

- ALL_WORKSPACES includes the following columns that are not in DBA_WORKSPACES: CONTINUALLY_REFRESHED, WORKSPACE_LOCKMODE, and WORKSPACE_LOCKMODE_OVERRIDE.
- DBA_WORKSPACES includes the following columns that are not in ALL_WORKSPACES: SID and SERIAL#.

Related Views

- ALL_WORKSPACES (Section 5.17) contains information about all workspaces.
- USER_WORKSPACES (Section 5.43) contains information about workspaces created by the current user.

Column	Datatype	Null?	Description
WORKSPACE	VARCHAR2(30)		Name of the workspace.
WORKSPACE_ID	NUMBER(38)		ID of the workspace.
PARENT_WORKSPACE	VARCHAR2(30)		Parent workspace of this workspace.
PARENT_SAVEPOINT	VARCHAR2(30)		Implicit savepoint that was created in the parent workspace when this workspace was created.
OWNER	VARCHAR2(30)		Name of the user that created the workspace.
CREATETIME	DATE		Date and time that the workspace was created.
DESCRIPTION	VARCHAR2(1000)		Description of the workspace.
FREEZE_STATUS	VARCHAR2(8)		FROZEN if the workspace is frozen (by a FreezeWorkspace operation); UNFROZEN if the workspace is not frozen.
FREEZE_MODE	VARCHAR2(20)		NO_ACCESS, READ_ONLY, 1WRITER, or 1WRITER_SESSION. See the freezemode parameter description for the FreezeWorkspace procedure in Chapter 4. If the value is 1WRITER_SESSION, you can examine the SID and SERIAL# column values to see which session has a lock on the workspace.

Column	Datatype	Null?	Description
FREEZE_WRITER	VARCHAR2(30)		The user allowed to make changes in the workspace; or null if the workspace is not frozen or if it is frozen in NO_ACCESS or READ_ONLY mode. See the freezewriter parameter description for the FreezeWorkspace procedure in Chapter 4.
SID	VARCHAR2(30)		Oracle session identifier (SID) of the associated session.
SERIAL#	VARCHAR2(30)		Serial number associated with the session.
FREEZE_OWNER	VARCHAR2(30)		Name of the user that froze the workspace.
SESSION_DURATION	VARCHAR2(3)		YES if the workspace is frozen only for the duration of the current session; NO if the workspace is frozen until an explicit UnfreezeWorkspace procedure call is made; null if the workspace is not currently frozen.
CURRENT_SESSION	VARCHAR2(3)		YES if the current session is allowed to make changes in the workspace; NO if the current session is not allowed to make changes in the workspace; null if the workspace is not currently frozen in session_duration mode.
RESOLVE_STATUS	VARCHAR2(8)		ACTIVE if a conflict resolution session is in progress; INACTIVE if a conflict resolution session is not in progress.
RESOLVE_USER	VARCHAR2(30)		Name of the user that started the conflict resolution session if resolve_status is ACTIVE; otherwise, null.
MP_ROOT_WORKSPACE	VARCHAR2(30)		Name of the root workspace of the multiparent graph; null if the workspace is not part of a multiparent graph. (Multiparent workspaces are explained in Section 1.1.10.)

5.26 ROLE_WM_PRIVS

ROLE_WM_PRIVS contains information about privileges that all roles granted to the current user have in each workspace.

Related View

- USER_WM_PRIVS (Section 5.36) contains information about privileges that the current user has in each workspace.

Column	Datatype	Null?	Description
ROLE	VARCHAR2(30)		Name of the role.
WORKSPACE	VARCHAR2(30)		Name of the workspace.
PRIVILEGE	VARCHAR2(22)		Name of the Workspace Manager privilege.
GRANTABLE	VARCHAR2(3)		YES if the role was given the grant option (that is, can grant the privilege to other users); NO if the role was not given the grant option.

5.27 USER_MP_GRAPH_WORKSPACES

USER_MP_GRAPH_WORKSPACES contains information about multiparent graph workspaces (explained in Section 1.1.10) for which the leaf workspace is owned by the current user. Its columns are the same as those in ALL_MP_GRAPH_WORKSPACES in Section 5.1.

5.28 USER_MP_PARENT_WORKSPACES

USER_MP_PARENT_WORKSPACES contains information about parent workspaces of multiparent workspaces (explained in Section 1.1.10) that the current user owns. Its columns are the same as those in ALL_MP_PARENT_WORKSPACES in Section 5.2.

5.29 USER_REMOVED_WORKSPACES

`USER_REMOVED_WORKSPACES` contains information about workspaces, that the current user owns, that have been removed during a RemoveWorkspace operation or a MergeWorkspace operation in which the `remove_workspace` parameter value was `true`, and while the value of the Workspace Manager system parameter `KEEP_REMOVED_WORKSPACES_INFO` was `ON`. (This system parameter is described in Section 1.5.) Its columns are the same as those in ALL_REMOVED_WORKSPACES in Section 5.3.

5.30 USER_WM_CONS_COLUMNS

USER_WM_CONS_COLUMNS contains information about columns in unique constraints on version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_CONS_COLUMNS in Section 5.5, except it does not contain an `OWNER` column.

5.31 USER_WM_CONSTRAINTS

USER_WM_CONSTRAINTS contains information about constraints on version-enabled tables that the current user owns. It provides information about the following kinds of constraints: `UNIQUE` constraint, unique index, `PRIMARY KEY` constraints, and `CHECK` constraints. Its columns are the same as those in ALL_WM_CONSTRAINTS in Section 5.6, except it does not contain an `OWNER` or `INDEX_OWNER` column.

5.32 USER_WM_IND_COLUMNS

USER_WM_IND_COLUMNS contains information about indexes used for enforcing unique constraints on version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_IND_COLUMNS in Section 5.7, except it does not contain an `OWNER` column.

5.33 USER_WM_IND_EXPRESSIONS

USER_WM_IND_EXPRESSIONS contains information about indexes used for enforcing unique constraints on version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_IND_EXPRESSIONS in Section 5.8, except it does not contain an `OWNER` column.

5.34 USER_WM_LOCKED_TABLES

USER_WM_LOCKED_TABLES contains information about Workspace Manager locks on rows in version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_LOCKED_TABLES in Section 5.9.

5.35 USER_WM_MODIFIED_TABLES

USER_WM_MODIFIED_TABLES contains information about version-enabled tables that have been modified and that the current user owns. Its columns are the same as those in ALL_WM_MODIFIED_TABLES in Section 5.10.

5.36 USER_WM_PRIVS

USER_WM_PRIVS contains information about privileges that the current user has in each workspace.

Related View

- ROLE_WM_PRIVS (Section 5.26) contains information about privileges that all roles granted to the current user have in each workspace.

Column	Datatype	Null?	Description
WORKSPACE	VARCHAR2(30)		Name of the workspace.
PRIVILEGE	VARCHAR2(22)		Name of the Workspace Manager privilege.
GRANTOR	VARCHAR2(30)		Name of the user that granted the privilege to the current user.
GRANTABLE	VARCHAR2(3)		YES if the user was given the grant option (that is, can grant the privilege to other users); NO if the user was not given the grant option.

5.37 USER_WM_RIC_INFO

USER_WM_RIC_INFO contains information about referential integrity constraints in version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_RIC_INFO in Section 5.11.

Workspace Manager uses this information to provide referential integrity support, which is described in Section 1.9.1.

5.38 USER_WM_TAB_TRIGGERS

USER_WM_TAB_TRIGGERS contains information about triggers that are owned by the current user and that are on version-enabled tables. Its columns are the same as those in ALL_WM_TAB_TRIGGERS in Section 5.12, except that it does not contain the TRIGGER_OWNER column.

5.39 USER_WM_VERSIONED_TABLES

USER_WM_VERSIONED_TABLES contains information about version-enabled tables that the current user owns. Its columns are the same as those in ALL_WM_VERSIONED_TABLES in Section 5.13.

5.40 USER_WM_VT_ERRORS

USER_WM_VT_ERRORS contains information about the error that occurred during the last call to the DisableVersioning or CommitDDL procedure that specified a table that the current user owns and on which the current user has one or more of the following privileges: SELECT, INSERT, DELETE, UPDATE. Its columns are the same as those in ALL_WM_VT_ERRORS in Section 5.14.

5.41 USER_WORKSPACE_PRIVS

USER_WORKSPACE_PRIVS contains information about Workspace Manager privileges in workspaces created by the current user. Its columns are the same as those in ALL_WORKSPACE_PRIVS in Section 5.15.

5.42 USER_WORKSPACE_SAVEPOINTS

USER_WORKSPACE_SAVEPOINTS contains information about savepoints in workspaces created by the current user. Its columns are the same as those in ALL_WORKSPACE_SAVEPOINTS in Section 5.16.

5.43 USER_WORKSPACES

USER_WORKSPACES contains information about workspaces created by the current user. Its columns are the same as those in ALL_WORKSPACES in Section 5.17.

5.44 WM_COMPRESS_BATCH_SIZES

WM_COMPRESS_BATCH_SIZES contains information related to compression capabilities for version-enabled tables. This view is only available to users with the WM_ADMIN_ROLE or SELECT_CATALOG_ROLE role.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)	NOT NULL	User name of the table owner.
TABLE_NAME	VARCHAR2(30)	NOT NULL	Name of the version-enabled table.
BATCH_SIZE	VARCHAR2(23)		TABLE if the table can be compressed as a single batch only; TABLE/PRIMARY_KEY_RANGE if the table can be compressed as a single batch or in multiple batches.
NUM_BATCHES	NUMBER		1 if BATCH_SIZE is TABLE, or a number specifying the number of batches to be used for compression operations when a batch size of PRIMARY_KEY_RANGE is used.

5.45 WM_COMPRESSIBLE_TABLES

WM_COMPRESSIBLE_TABLES contains information about version-enabled tables that need to be compressed (if compression is to be performed) between two savepoints in a workspace. To create rows in this view, use the SetCompressWorkspace procedure.

Column	Datatype	Null?	Description
OWNER	VARCHAR2(30)	NOT NULL	User name of the table owner.
TABLE_NAME	VARCHAR2(30)	NOT NULL	Name of the version-enabled table.
WORKSPACE	VARCHAR2(256)		Name of a workspace that was set as a result of a call to the SetCompressWorkspace procedure.

Column	Datatype	Null?	Description
BEGIN_SAVEPOINT	VARCHAR2(256)		Savepoint on the first version of the compression range. If the firstSP parameter was null in the call to the SetCompressWorkspace procedure, this column contains BEGINNING.
END_SAVEPOINT	VARCHAR2(256)		Savepoint on the last version of the compression range. If both the firstSP and secondSP parameters were null in the call to the SetCompressWorkspace procedure, this column contains LATEST.

5.46 WM_EVENTS_INFO

WM_EVENTS_INFO contains information about the capture of Workspace Manager events. For information about Workspace Manager events, see Chapter 2.

Column	Datatype	Null?	Description
EVENT_NAME	VARCHAR2(30)	NOT NULL	Name indicating the type of event.
CAPTURE	VARCHAR2(30)		ON if events of this type are being captured; OFF if events of this type are not being captured.

5.47 WM_INSTALLATION

WM_INSTALLATION contains information about the installed release of Workspace Manager. The information includes the Workspace Manager version number (OWM_VERSION) and the Workspace Manager system parameters.

Column	Datatype	Null?	Description
NAME	VARCHAR2(100)		Name of an informational item or system parameter pertaining to the current release of Workspace Manager on the system. (System parameters are explained in Section 1.5.)
VALUE	VARCHAR2(4000)		Value associated with the informational item or system parameter identified in the NAME column.

5.48 WM_REPLICATION_INFO

WM_REPLICATION_INFO contains information about the Workspace Manager replication environment. For information about using Oracle replication with Workspace Manager, see Appendix C.

Column	Datatype	Null?	Description
GROUPNAME	VARCHAR2(30)	NOT NULL	Name of the main group for replication.
WRITERSITE	VARCHAR2(128)		Name of the writer site in the replication environment.

5.49 xxx_CONF Views

There is one conflict view for each version-enabled table. Each conflict view has a name in the form <table_name>_CONF. For example, if the EMPLOYEE table is version-enabled, the EMPLOYEE_CONF metadata view exists.

Each conflict view contains the columns shown in Table 5–1.

Table 5–1 Columns in the xxx_CONF Views

Column	Datatype	Description
WM_WORKSPACE	VARCHAR2(256)	Workspace in which the conflict exists.
(One column for each column in original table)	(Same as column in original table)	Value of the column in this workspace.
WM_VALID	WM_PERIOD	Time period during which the row is valid, if the table has valid time support (described in Chapter 3). If you set the USE_SCALAR_TYPES_FOR_VALIDATION system parameter (described in Section 1.5) to ON, this column is replaced by two columns, WM_VALIDFROM and WM_VALIDTILL, of type TIMEZONE WITH TIMESTAMP.
WM_DELETED	VARCHAR2(3)	YES if the row has been deleted; NO if the row has not been deleted; NE if the row is nonexistent (does not exist).
WM_CONFLICTPERIOD	WM_PERIOD	Overlapping period of the rows for which conflicts were detected, if the table has valid time support (described in Chapter 3).

A SELECT operation from a conflict view uses the workspace conflict context established by the GotoWorkspace procedure, unless you have specified a workspace conflict context for the session by using the SetConflictWorkspace procedure. Selecting from the conflict view finds rows in that table that are changed in the current workspace context, and compares their values with corresponding rows in the parent workspace to identify conflicts. If the current workspace conflict context is the LIVE workspace, all rows in the table are selected and no conflicts are found.

The following example lists the key value and all column values of conflicting rows in the EMPLOYEE table in the current workspace and its parent workspace. The conflict view reflects the context established by a previous call to the GetWorkspace or SetConflictWorkspace procedure to set the workspace conflict context (the current workspace in this case).

```
SELECT * FROM EMPLOYEE_CONF;
```

If ID, NAME, and CITY are the columns in the EMPLOYEE table, then assume the following values:

```
WM_WORKSPACE  ID   NAME    CITY     WM_DELETED
NEWWORKSPACE  12   SMITH   NASHUA   NO
DiffBase      12   SMITH   NY       NO
LIVE          12   SMITH   BOSTON   NO
```

The database row identified by ID = 12 was changed in NEWWORKSPACE and LIVE workspaces. In NEWWORKSPACE the city was changed to NASHUA, and in the LIVE workspace the city was changed to BOSTON. When NEWWORKSPACE is merged into LIVE, this row will show up as a conflict. The application must pick between the choices and resolve conflicts in favor of the workspace with the desired value.

Note that DiffBase refers to the common ancestor (or *base*), as explained in the Usage Notes for the SetDiffVersions procedure.

The following example begins a conflict resolution session, calls the ResolveConflicts procedure to delete the conflicting row from the NEWWORKSPACE workspace and to insert the value in the parent workspace (LIVE) into both workspaces, commits the transaction, and ends the conflict resolution session.

```
DBMS_WM.BeginResolve ('NEWWORKSPACE');
DBMS_WM.ResolveConflicts ('NEWWORKSPACE', 'EMPLOYEE', 'ID = 12', 'PARENT');
COMMIT;
DBMS_WM.CommitResolve ('NEWWORKSPACE');
```

For additional information about conflict resolution, see Section 1.1.4.

5.50 xxx_DIFF Views

There is one difference view for each version-enabled table. Each difference view has a name in the form <table_name>_DIFF. For example, if the EMPLOYEE table is version-enabled, the EMPLOYEE_DIFF metadata view exists. Rows are added to one or more *xxx*_DIFF views each time the SetDiffVersions procedure is executed.

Each difference view contains the columns shown in Table 5–2.

Table 5–2 Columns in the xxx_DIFF Views

Column	Datatype	Description
(One column for each column in original table)	(Same as column in original table)	Value of the column in this workspace.
WM_VALID	WM_PERIOD	Time period during which the row is valid, if the table has valid time support (described in Chapter 3). If you set the USE_SCALAR_TYPES_FOR_VALIDATION system parameter (described in Section 1.5) to ON, this column is replaced by two columns, WM_VALIDFROM and WM_VALIDTILL, of type TIMEZONE WITH TIMESTAMP.
WM_DIFFVER	VARCHAR2(256)	Branch from which the values in the preceding columns are taken. (See the explanation following this table.)
WM_CODE	VARCHAR2(2)	One of the following codes describing the change: U (updated), D (deleted), I (inserted), NC (no change), NE (nonexistent).
WM_DIFFPERIOD	WM_PERIOD	Overlapping period of the rows for which a difference was detected, if the table has valid time support (described in Chapter 3).

The WM_DIFFVER value is in one of the following formats:

- '<workspace1>, <savepoint1>'
- '<workspace2>, <savepoint2>'
- 'DiffBase'

If the two-parameter version of the SetDiffVersions procedure was used, the value of savepoint1 or savepoint2 is LATEST.

Note the following about the possible values for WM_CODE:

- NC will appear for rows in workspaces that did not change the value when another workspace did change the value. For example, if '<workspace2>, <savepoint2>' updated the row, the code for that row is U, but the code for the '<workspace1>, <savepoint1>' and 'DiffBase' rows is NC if they did not modify the row.
- NE will appear for 'DiffBase' if a row is inserted in one or more branches, and NE will appear for 'DiffBase' and a branch if only one branch has had any insert operations.

For more information, including an example showing rows being added to a differences view, see the section on the SetDiffVersions procedure in Chapter 4.

5.51 xxx_HIST Views

There is one history view for each version-enabled table if the table was version-enabled with the hist parameter set to VIEW_W_OVERWRITE or VIEW_WO_OVERWRITE in the call to the EnableVersioning procedure. Each history view has a name in the form <table_name>_HIST. For example, if the EMPLOYEE table is version-enabled with the hist parameter set to VIEW_W_OVERWRITE or VIEW_WO_OVERWRITE, the EMPLOYEE_HIST metadata view exists.

You can use the history views to log and audit modifications to version-enabled tables.

Each history view contains the columns shown in Table 5–3.

Table 5–3 Columns in the xxx_HIST Views

Column	Datatype	Description
(One column for each column in original table)	(Same as column in original table)	Value of the column in this workspace.
WM_VALID	WM_PERIOD	Time period during which the row is valid, if the table has valid time support (described in Chapter 3). If you set the USE_SCALAR_TYPES_FOR_VALIDATION system parameter (described in Section 1.5) to ON, this column is replaced by two columns, WM_VALIDFROM and WM_VALIDTILL, of type TIMEZONE WITH TIMESTAMP.
WM_WORKSPACE	VARCHAR2(30)	Name of the workspace containing the row.
WM_VERSION	NUMBER(30)	Version number of the row with which the data is associated.
WM_USERNAME	VARCHAR2(100)	Name of the user that created the row.
WM_OPTYPE	VARCHAR2(1)	Type of change operation that was performed on the row: D (delete), I (insert), or U (update).
WM_CREATETIME	TIMESTAMP WITH TIME ZONE	Time when the row was created or updated.
WM_RETIRETIME	TIMESTAMP WITH TIME ZONE	Time when the row was deleted or modified.

5.52 xxx_LOCK Views

There is one lock view for each version-enabled table. Each lock view has a name in the form <table_name>_LOCK. For example, if the EMPLOYEE table is

version-enabled, the EMPLOYEE_LOCK metadata view exists. (For an explanation of Workspace Manager locking, see Section 1.3.)

Each lock view contains the columns shown in Table 5–4.

Table 5–4 Columns in the xxx_LOCK Views

Column	Datatype	Description
(One column for each column in original table)	(Same as column in original table)	Value of the column in this workspace.
WM_VALID	WM_PERIOD	Time period during which the row is valid, if the table has valid time support (described in Chapter 3). If you set the USE_SCALAR_TYPES_FOR_VALIDATION system parameter (described in Section 1.5) to ON, this column is replaced by two columns, WM_VALIDFROM and WM_VALIDTILL, of type TIMEZONE WITH TIMESTAMP.
WM_LOCKMODE	VARCHAR2(19)	Type of lock: EXCLUSIVE, WORKSPACE EXCLUSIVE, VERSION EXCLUSIVE, or SHARED.
WM_USERNAME	VARCHAR2(100)	User name of the owner of the lock.
WM_LOCKINGWORKSPACE	VARCHAR2(100)	Name of the workspace in which the lock was placed.
WM_INCURWORKSPACE	VARCHAR2(3)	YES if the row is contained in the current workspace; NO if the row is not contained in the current workspace.

5.53 xxx_MW Views

There is one multiworkspace view for each version-enabled table. Each multiworkspace view has a name in the form <table_name>_MW. For example, if the EMPLOYEE table is version-enabled, the EMPLOYEE_MW metadata view exists. Rows are added to one or more *xxx*_MW views each time the SetMultiWorkspaces procedure (described in Chapter 4) is executed.

Each multiworkspace view contains the columns shown in Table 5–5.

Table 5–5 Columns in the xxx_MW Views

Column	Datatype	Description
(One column for each column in original table)	(Same as column in original table)	Value of the column in this workspace.
WM_VALID	WM_PERIOD	Time period during which the row is valid, if the table has valid time support (described in Chapter 3). If you set the USE_SCALAR_TYPES_FOR_VALIDATION system parameter (described in Section 1.5) to ON, this column is replaced by two columns, WM_VALIDFROM and WM_VALIDTILL, of type TIMEZONE WITH TIMESTAMP.
WM_MODIFIED_BY	VARCHAR2(30)	Workspace containing the row that was modified.

Table 5–5 (Cont.) Columns in the xxx_MW Views

Column	Datatype	Description
WM_SEEN_BY	VARCHAR2(4000)	Comma-delimited list of workspaces from which the row is visible.
WM_OPTYPE	VARCHAR2(1)	One of the following codes describing the change: U (updated), I (inserted).

You can use the <table_name>_MW view to see changes in another workspace without leaving the current workspace (for example, to check if there is a conflict with the other workspace). Each row in the view shows the data as it would be in that workspace if the workspace had been merged when the row was inserted in the view.

You can also use the <table_name>_DIFF view (see Section 5.50) to see changes in another workspace without leaving the current workspace; however, the <table_name>_DIFF view can be used for only two workspaces, whereas the <table_name>_MW view can be used for any number of workspaces. In addition, the <table_name>_DIFF view shows deleted rows, whereas the <table_name>_MW view does not show deleted rows.

For more information and several examples, see the information about the SetMultiWorkspaces procedure in Chapter 4.

Part III

Supplementary Information

This document has three parts:

- Part I provides conceptual and usage information about Workspace Manager.
- Part II provides reference information about the Workspace Manager PL/SQL API (DBMS_WM package) and static data dictionary views.
- Part III provides supplementary information (appendixes and a glossary).

Part III contains the following:

A

Installing Workspace Manager with Custom Databases

Workspace Manager is installed by default in the seed database and in all databases created by the Database Configuration Assistant (DBCA). However, in all other Oracle databases, such as those you create with a customized procedure, you must install Workspace Manager before you can use its features.

To install Workspace Manager in a custom database, do the following:

1. At the system command prompt, change the current directory to the directory that contains Workspace Manager installation script and packages, as shown in the following example:

   ```
   cd <ORACLE_HOME>/rdbms/admin
   ```

2. Connect as `SYS` to the Oracle instance with a command in the following format:

   ```
   sqlplus sys
   ```

   Enter the password for the `SYS` account when you are prompted.

3. Run the `owminst.plb` script:

   ```
   SQL> @owminst.plb
   ```

4. Verify the installation of Workspace Manager by entering the following command while connected as any valid database user, and ensure that the output is as shown here:

   ```
   SQL> select dbms_wm.getWorkspace from dual;

   GETWORKSPACE
   --------------------------------------------------------------------------------
   LIVE
   ```

B

Migrating to Another Workspace Manager Release

This appendix describes how to migrate version-enabled tables from one release of Workspace Manager to another release. You can either upgrade to the current release or downgrade to a previous major release (no earlier than release 9.0.1). For example:

- If you have been working with version-enabled tables with a previous Oracle Workspace Manager release (9.0.1.0.0 or higher), you can upgrade to release 11.1 to preserve your existing work and then continue working with release 11.1. (Note that an Oracle Workspace Manager release lower than 11.1 could have been installed on a release 8.1.6.0.0 or higher Oracle database.)
- If you are using Workspace Manager with Oracle Database 11*g* but need to go back to release 10.2 or 10.1, you can downgrade to release 10.2 or 10.1 to preserve your existing work and then continue working with release 10.2 or 10.1.

For an upgrade or downgrade operation, the tables can remain version-enabled. You do not need to disable versioning before performing an upgrade or downgrade.

B.1 Upgrading Workspace Manager

To upgrade Workspace Manager from an earlier release to the highest current release number for a given major release, ensure that you have the appropriate patch set for the release to which you want to upgrade. You can find the latest patch set on My Oracle Support (formerly called MetaLink). To perform the upgrade, follow these steps.

1. At a system prompt, change to the installation directory of the release to which you are upgrading. If you are upgrading to the Workspace Manager release that is included in the current Oracle Database 11*g* installation, change to `$ORACLE_HOME/rdbms/admin`.
2. Start SQL*Plus.
3. Connect to the database instance as a user with `SYSDBA` privileges.
4. Shut down the instance:

   ```
   SQL> SHUTDOWN IMMEDIATE
   ```

5. Start the instance in RESTRICT mode:

   ```
   SQL> STARTUP RESTRICT
   ```

6. Determine the current release of the Workspace Manager software by finding the value of `OWM_VERSION` in the WM_INSTALLATION view:

```
SQL> SELECT * FROM wm_installation;
```

If the OWM_VERSION value is NOT_INSTALLED, Workspace Manager is not currently installed.

If the OWM_VERSION value is BETA_RELEASE, the upgrade is not supported. Use DisableVersioning on all version-enabled tables, uninstall the old release of Workspace Manager using the old uninstall script, and install the new release of the Workspace Manager software.

If the WM_INSTALLATION view does not exist, run the following script to create the view.

```
SQL> @owmcmdv.plb
```

7. Set the system to spool results to a log file for later verification of success. For example:

```
SQL> SPOOL catoutowmu.log
```

8. Run the owmupgrd.plb upgrade script:

```
SQL> @owmupgrd.plb
```

9. Verify whether or not the upgrade was successful:

```
SELECT * FROM all_wm_vt_errors;
```

This view should be empty. If it has any rows, the upgrade did not complete successfully. To recover one or more tables that were left in an inconsistent state because of the upgrade failure, use the RecoverAllMigratingTables or RecoverAllMigratingTables procedure, both of which are described in Chapter 4.

10. Verify the current version of Workspace Manager:

```
SELECT * FROM wm_installation;
```

The value of OWM_VERSION is the new version of Workspace Manager.

11. Turn off the spooling of script results to the log file:

```
SQL> SPOOL OFF
```

12. Disable the RESTRICTED SESSION feature for the instance:

```
SQL> ALTER SYSTEM DISABLE RESTRICTED SESSION;
```

B.2 Downgrading to a Previous Release

Downgrading is ***strongly discouraged***, except for rare cases where it is necessary. If you downgrade to a previous release, you will not benefit from bug fixes and enhancements that have been made in intervening releases.

To downgrade from the current Workspace Manager release to a previous major release, ensure that you have the appropriate patch set for the release to which you want to downgrade. You can find Workspace Manager patch sets on My Oracle Support (formerly called MetaLink). The following downgrade options are supported:

- Downgrading from a release to the base release of the same major version (for example, from Workspace Manager 9.2.0.x to Workspace Manager 9.2.0.1). If you need to downgrade to a release other than the base release, you must downgrade to the base release and then upgrade to the desired release number.

- Downgrading from any release to the base release of the previous major version (for example, from Workspace Manager 10.1.0 to Workspace Manager 9.2.0.1)

To perform a Workspace Manager downgrade, follow these steps. (The main steps are running the appropriate `.sql` and `.plb` files.)

1. Copy the appropriate `.plb` file from the patch set for the latest installed Workspace Manager release to the `$ORACLE_HOME/rdbms/admin` directory for the patch set of the Workspace Manager release to which you want to downgrade.

   This file has a name in the form `owmd`*`nnn`*`.plb`, where *nnn* reflects the number of the latest installed Workspace Manager release. For example, for downgrading from release 9.2.0.5.1, the name of the file is `owmd920.plb`.

2. Note the location (under where you unzipped the patch set for the latest installed Workspace Manager release) of the appropriate `owme`*`nnn`*`.sql` file, where *nnn* reflects the number of the latest installed Workspace Manager release. For example, for downgrading from release 9.2.0.5.1, the name of the file is `owme920.sql`.

3. Start SQL*Plus, and connect as `SYS AS SYSDBA`. (You can connect as another user, but it must be `AS SYSDBA`.)

4. Shut down the instance, and restart it in `RESTRICT` mode:

   ```
   SQL> SHUTDOWN IMMEDIATE
   SQL> STARTUP RESTRICT
   ```

5. Optionally, set the system to spool results to a log file for later verification of success. For example:

   ```
   SQL> SPOOL catoutowmd.log
   ```

6. Run the `.sql` file that you noted in step 2. For example:

   ```
   SQL> @C:\my_patches\92051_OWM\owme920.sql
   ```

7. Run the `.plb` file that you copied in step 1. For example:

   ```
   SQL> @$ORACLE_HOME\rdbms\admin\owmd920.plb
   ```

8. Verify whether or not the downgrade was successful:

   ```
   SELECT * FROM wm_downgrade_tables;
   ```

   This table should not exist. If it exists and has any rows, the downgrade did not complete successfully; contact Oracle Support Services.

9. Verify the current version of Workspace Manager:

   ```
   SELECT * FROM wm_installation;
   ```

   The value of `OWM_VERSION` is the new version of Workspace Manager.

10. If you enabled spooling in step 5, turn off the spooling of script results to the log file:

    ```
    SQL> SPOOL OFF
    ```

11. Disable the `RESTRICTED SESSION` feature for the instance:

    ```
    SQL> ALTER SYSTEM DISABLE RESTRICTED SESSION;
    ```

B.3 History Management Changes Effective With Release 10.1

For Oracle Database release 10.1, Workspace Manager implemented history management changes that are especially of interest if you want to perform an upgrade or downgrade operation. Workspace Manager uses the `TIMESTAMP WITH TIME ZONE` type with history data, whereas before release 10.1 it used the `DATE` type.

Using a timestamp with a time zone has several benefits:

- Finer granularity. Workspace Manager uses a time granularity of microseconds, whereas for the `DATE` type the granularity is seconds.
- Correct interpretation of times when information is imported, exported, or replicated across time zones.

The following considerations apply to the history management changes for release 10.1:

- The `TIMESTAMP WITH TIME ZONE` type is used only in Oracle9*i* and higher releases. In release 8.1.7, Workspace Manager uses the DATE type for history management.
- The GotoDate procedure has a format (with the `fmt` parameter) that enables you to specify a timestamp or a date, with the same options as for the `TO_DATE` function, described in *Oracle Database SQL Language Reference*. The `in_date` parameter is of type `VARCHAR2` to support Workspace Manager on all relevant Oracle releases (because the `TIMESTAMP WITH TIME ZONE` type is not available on Oracle releases before Oracle9*i*).
- Workspace Manager allows tables with history columns of `DATE` and `TIMESTAMP WITH TIME ZONE` types to coexist, so that data exported from release 8.1.7 can be imported into Oracle9*i*. Tables that are version-enabled using the release 10.1 or higher will use the `TIMESTAMP WITH TIME ZONE` type for history management.
- You can upgrade the history columns of either all version-enabled tables or an individual version-enabled table:

  `WMSYS.OWM_MIG_PKG.UpgradeHistoryColumns` with no parameters upgrades the history columns of all version-enabled tables

  `WMSYS.OWM_MIG_PKG.UpgradeHistoryColumns(owner_var VARCHAR2, table_name_var VARCHAR2)` upgrades the history column of a specified version-enabled table.
- Downgrading to an earlier version of Workspace Manager changes the history columns back to the DATE type.

C

Using Replication with Workspace Manager

Workspace Manager supports replication of all workspace-related entities (such as workspaces and savepoints), operations (such as CreateWorkspace and MergeWorkspace), and DML and DDL operations on version-enabled tables. To use replication in a Workspace Manager environment, you must understand the major replication concepts and techniques, as documented in *Oracle Database Advanced Replication* and *Oracle Database Advanced Replication Management API Reference*. However, some special guidelines and procedures apply to replication with Workspace Manager, as described in this appendix.

Workspace Manager supports multimaster replication in an asynchronous mode with certain restrictions. The main restriction imposed on the replication sites is that only the master definition site in the multimaster setup can perform workspace operations and DML and DDL operations on version-enabled tables. All other sites are disallowed from performing any write operations. All read operations, such as GotoWorkspace or SELECT queries on version-enabled tables, are allowed on all sites in the replication environment.

In a Workspace Manager replication environment, the master definition site is referred to as the **writer site**, and all other master sites in the multimaster group are referred to as **nonwriter sites**.

To call any of the Workspace Manager replication support subprograms, you must be the replication administrator at all the master sites. You must also be registered as the receiver for all groups at the local master definition site. If the master definition site is changed using the RelocateWriterSite procedure, you must be registered as the receiver for all groups at the new writer site.

C.1 Setting Up Replication with Workspace Manager

This section describes the typical steps for setting up a replication environment for a database with workspaces and version-enabled tables.

1. Set up users and database links for replication, according to the guidelines and procedures in *Oracle Database Advanced Replication*.
2. Generate replication support for the Workspace Manager environment by executing the GenerateReplicationSupport procedure at the site chosen to be the writer site. The following example creates a replication group named `OWM-GROUP` and designates `BACKUP-SITE1.EXAMPLE.COM` and `BACKUP-SITE2.EXAMPLE.COM` as nonwriter sites.

```
DBMS_WM.GenerateReplicationSupport(
   mastersites       =>  'BACKUP-SITE1.EXAMPLE.COM, BACKUP-SITE2.EXAMPLE.COM'),
   groupname         =>  'OWM-GROUP',
   groupdescription  =>  'OWM Replication group for Example Corp.');
```

If you need to drop replication support for the Workspace Manager environment, execute the DropReplicationSupport procedure.

For reference and usage information about these procedures, see the sections on the GenerateReplicationSupport and DropReplicationSupport procedures in Chapter 4.

After replication is set up, the specified group appears as a regular group in the Replication catalog. In addition, for each version-enabled table at the local master definition site, Workspace Manager creates a group with a name in the form WM$<*object-id*>, where <*object-id*> is the object ID of the table <*table-name*>_LT at the local site. The groups that you specify and the groups created by Workspace Manager can be managed using standard the replication API or Oracle Enterprise Manager.

C.2 Enabling and Disabling Versioning of Tables with Replication Support

After Workspace Manager replication support has been set up (as described in Section C.1), you can version-enable a table to be replicated by executing the EnableVersioning procedure on the writer site, as long as the table is defined in exactly the same way on all the nonwriter sites. For example, to enable versioning on the `SCOTT.EMP` table on all master sites, execute the following as the replication administrator on the writer site:

```
SQL> EXECUTE DBMS_WM.EnableVersioning('SCOTT.EMP');
```

This example performs the following operations:

- Version-enables `SCOTT.EMP` at the local (writer) site and at all remote (nonwriter) sites.
- Creates a new master group for this table. The group name is in the format WM$<obj#>, where <obj#> is the Oracle object ID for the table `SCOTT.EMP_LT`. This is a regular replication group that can be managed through the Oracle Enterprise Manager Replication tool.
- Starts the master activity for the newly created master group.

To disable versioning on a table in a Workspace Manager replication environment, execute the DisableVersioning procedure on the writer site. For example, to disable versioning on the `SCOTT.EMP` table on all master sites, execute the following as the replication administrator on the writer site:

```
SQL> EXECUTE DBMS_WM.DisableVersioning('SCOTT.EMP');
```

This example performs the following operations:

- Version-disables `SCOTT.EMP` at the local (writer) site and at all remote (nonwriter) sites.
- Drops the master group that was created for this table.

C.3 DDL Operations with Replicated Version-Enabled Tables

To perform DDL operations on any version-enabled table, you must follow the guidelines in Section 1.8. If the version-enabled table is replicated, the following additional guidelines apply:

- If a version-enabled table is replicated, BeginDDL, CommitDDL, and RollbackDDL operations on the table can be done only by the replication administrator and only at the writer site.
- The replication group associated with a version-enabled table must be quiesced before a CommitDDL operation on the table, and unquiesced after a CommitDDL operation on the table.

C.4 Relocating the Writer Site

The writer site in a Workspace Manager replication environment can be changed after the environment is set up without quiescing the master groups. Relocating the writer site is especially useful when the writer site becomes unavailable and a new writer site needs to be specified.

To relocate the writer site, execute the RelocateWriterSite procedure. For guidelines and an example, see the reference information about the RelocateWriterSite procedure in Chapter 4.

If the old writer site is not available when you relocate the writer site, you must execute the SynchronizeSite procedure after the old writer site becomes available. For guidelines and an example, see the reference information about the SynchronizeSite procedure in Chapter 4.

D

Workspace Manager Error Messages

This appendix lists the Workspace Manager error messages, including the cause and recommended user action for each.

WM_ERROR_1 name of column *'string'* has more than 28 characters

Cause: An attempt was made to version-enable a table that had a column with a name that has more than 28 characters.

Action: Ensure that all column names for the table are 28 characters or less.

WM_ERROR_2 *'string'* is not allowed for workspace: *'string'* frozen in *'string'* mode

Cause: An operation was executed on a workspace that was frozen.

Action: Unfreeze the workspace before retrying the operation.

WM_ERROR_3 cannot modify primary key values for version-enabled table

Cause: A DML operation that modifies one or more values in columns in the primary key constraint was performed on a version-enabled table.

Action: Do not perform DML operations on columns in the primary key constraints of version-enabled tables.

WM_ERROR_4 There are open short transactions on this table.

Cause: DisableVersioning failed because there were open database transactions on the table to be version-disabled.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_5 integrity constraint (*'string'.'string'*) violated - child record found

Cause: An attempt was made to delete or update a record in a parent table of a referential integrity constraint with the RESTRICT option, and there was a matching record in the child table of the integrity constraint. RESTRICT is a default property of a referential integrity constraint, the other being ON DELETE CASCADE, where the dependent rows in the child tables are deleted if corresponding rows in the parent table are deleted. The CASCADE option applies only to a deletion from the parent table. An update of the parent table always follows the RESTRICT option.

Action: Delete all matching records from the child table first.

WM_ERROR_6 integrity constraint (*'string'.'string'*) violated - parent key not found

Cause: An attempt was made to insert or update a record in a child table of a referential integrity constraint, and there was no matching record in the parent table of the integrity constraint.

Action: Insert a matching record in the parent table first.

WM_ERROR_7 WM not found on the import platform

Cause: Import of a version-enabled database failed because the import platform did not have Workspace Manager installed.

Action: Install Workspace Manager on the import platform and retry.

WM_ERROR_8 the import platform cannot have any versioned tables

Cause: Import of a version-enabled database failed because the import platform already had one or more version-enabled tables.

Action: The import platform may not have any version-enabled tables. A clean install of Workspace Manager is needed on the import platform.

WM_ERROR_9 the import platform has non-"LIVE" workspaces or explicit savepoints

Cause: Import of a version-enabled database failed because the import platform had either non-`LIVE` workspaces in the workspace hierarchy or explicit savepoints in the `LIVE` workspace.

Action: The import platform may have only the `LIVE` workspace and there may be no explicit savepoints. A clean install of Workspace Manager is needed on the import platform.

WM_ERROR_10 unique key violation

Cause: An insert operation failed because it violated the table's primary key constraint.

Action: Ensure that the primary key is not violated by the insert operation in the current workspace.

WM_ERROR_11 need to be on the latest version to delete

Cause: A delete operation failed because the delete was being made in a non-`LATEST` version of a workspace.

Action: Ensure that the current session is on the `LATEST` version in the workspace by using the GotoWorkspace or GotoSavepoint procedures.

WM_ERROR_12 need to be on the latest version to insert

Cause: An insert operation failed because the insert was being made in a non-`LATEST` version of a workspace.

Action: Ensure that the current session is on the `LATEST` version in the workspace by using the GotoWorkspace or GotoSavepoint procedures.

WM_ERROR_13 need to be on the latest version to update

Cause: An update operation failed because the update was made in a non-`LATEST` version of a workspace.

Action: Ensure that the current session is on the `LATEST` version in the workspace by using the GotoWorkspace or GotoSavepoint procedures.

WM_ERROR_14 *'string'.'string'* has not been version enabled

Cause: This operation failed because it can only be invoked on a version-enabled table.

Action: Verify that the table is version-enabled.

WM_ERROR_15 "/" is not allowed in a workspace name

Cause: CreateWorkspace failed because the workspace name contained a "/".

Action: Choose another workspace name that does not contain a "/".

WM_ERROR_16 "WM_ADMIN_ROLE" is required to version disable a table in another schema

Cause: DisableVersioning failed because only a user with WM_ADMIN_ROLE role can version-disable a table in another schema.

Action: Ensure that the invoking user has the required privileges before attempting to version-disable this table. Otherwise, have the owner of the table version-disable it.

WM_ERROR_17 "WM_ADMIN_ROLE" is required to version enable a table in another schema

Cause: EnableVersioning failed because only a user with WM_ADMIN_ROLE can version-enable a table in another schema.

Action: Ensure that the invoking user has the required privileges before attempting to version-enable this table. Otherwise, have the owner of the table version-enable it.

WM_ERROR_18 "WM_ADMIN_ROLE" or ownership is required to alter workspace attributes

Cause: AlterWorkspace failed because only a user with WM_ADMIN_ROLE or the owner of the workspace can alter workspace attributes.

Action: Ensure that the invoking user has the required privileges before attempting to alter the workspace attributes. Otherwise, have the owner of the workspace alter the workspace attributes.

WM_ERROR_19 "WM_ADMIN_ROLE" or ownership is required to freeze a workspace

Cause: FreezeWorkspace failed because only a user with WM_ADMIN_ROLE or the owner of the workspace can freeze a workspace.

Action: Ensure that the invoking user has the required privileges before attempting to freeze the workspace. Otherwise, have the owner of the workspace freeze it.

WM_ERROR_20 "WM_ADMIN_ROLE" or ownership is required to set workspace lock mode

Cause: SetWorkspaceLockModeOn failed because only a user with WM_ADMIN_ROLE role or the owner of the workspace can set the workspace lock mode.

Action: Ensure that the invoking user has the required privileges before attempting to set the workspace lock mode. Otherwise, have the owner of the workspace set the workspace lock mode.

WM_ERROR_21 insufficient privileges to change savepoint attributes

Cause: AlterSavepoint failed because only a user with WM_ADMIN_ROLE role or the owner of the workspace or savepoint can alter the savepoint attributes.

Action: Ensure that the invoking user has the required privileges before attempting to alter the savepoint attributes. Otherwise, have the workspace owner or the savepoint owner alter the savepoint attributes.

WM_ERROR_22 insufficient privileges to delete savepoint

Cause: DeleteSavepoint failed because only a user with WM_ADMIN_ROLE role or the owner of the workspace or savepoint can delete the savepoint.

Action: Ensure that the invoking user has the required privileges before attempting to delete the savepoint. Otherwise, have the workspace owner or the savepoint owner delete the savepoint.

WM_ERROR_23 a workspace already exists with the name: *'string'*

Cause: CreateWorkspace failed because a workspace with the same name already existed in the system. Workspace Manager requires that workspace names be unique across the database.

Action: Choose another workspace name and retry.

WM_ERROR_24 a workspace cannot be rolled back over an implicit savepoint

Cause: A RollbackWorkspace operation was invoked on a non-leaf workspace across an implicit savepoint.

Action: Do not rollback over an implicit savepoint. To remove the implicit savepoint, merge or remove the descendant workspace.

WM_ERROR_25 a table cannot be merged from the "LIVE" workspace

Cause: MergeTable was invoked with the input workspace specified as the `LIVE` workspace. The `LIVE` workspace is the root workspace in the workspace hierarchy tree.

Action: Do not invoke MergeTable with the workspace parameter `LIVE`.

WM_ERROR_27 a table cannot be refreshed to the "LIVE" workspace

Cause: RefreshTable was invoked with the input workspace specified as the `LIVE` workspace. The `LIVE` workspace is the root workspace in the workspace hierarchy tree.

Action: Do not invoke RefreshTable with the workspace parameter `LIVE`.

WM_ERROR_28 a table cannot be rolled back over an implicit savepoint

Cause: A RollbackTable operation was invoked on a non-leaf workspace across an implicit savepoint.

Action: Do not rollback over an implicit savepoint. To remove the implicit savepoint, merge or remove the descendant workspace.

WM_ERROR_29 cannot rollback this table using RollbackTable

Cause: RollbackTable failed because the table to be rolled back is part of a referential integrity constraint.

Action: Use RollbackWorkspace or RollbackToSP instead.

WM_ERROR_30 cannot merge this table using MergeTable

Cause: MergeTable failed because the table to be merged is part of a referential integrity constraint.

Action: Use MergeWorkspace instead.

WM_ERROR_31 All version enabled tables owned by *'string'* must be disabled first.

Cause: An attempt was made to drop a database user who owns one or more version-enabled tables.

Action: Ensure that all the version-enabled tables owned by the user have been explicitly disabled before attempting to drop the database user.

WM_ERROR_32 An index-organized table cannot be version enabled.

Cause: Workspace Manager does not support index-organized tables.

Action: Ensure the table to be version-enabled is not index-organized.

WM_ERROR_33 attempt to *'string'* a row locked by: *'string'* in workspace *'string'*

Cause: A DML operation failed because the row was previously locked.

Action: Wait for the lock on the row to be released or have the lock owner use the UnlockRows procedure to unlock the row. Consult the table's _LOCK view to see which rows in this table are locked.

WM_ERROR_34 attempt to *'string'* a row locked by *'string'* in workspace: *'string'*

Cause: A DML operation failed because the row was previously locked.

Action: Wait for the lock on the row to be released or have the lock owner use the UnlockRows procedure to unlock the row. Consult the table's _LOCK view to see which rows in this table are locked.

WM_ERROR_35 attempt to lock a row locked in workspace: *'string'*

Cause: The operation failed because a lock could not be obtained on the row, since it was already locked.

Action: Wait for the lock on the row to be released or have the lock owner use the UnlockRows procedure to unlock the row. Consult the table's _LOCK view to see which rows in this table are locked.

WM_ERROR_36 attempt to lock a row locked by *'string'*

Cause: The operation failed because a lock could not be obtained on the row, since it was already locked.

Action: Wait for the lock on the row to be released or have the lock owner use the UnlockRows procedure to unlock the row. Consult the table's _LOCK view to see which rows in this table are locked.

WM_ERROR_37 attempt to modify a WM generated procedure

Cause: An attempt to drop or re-create a database procedure failed because that procedure was created by Workspace Manager.

Action: Do not drop or re-create this procedure.

WM_ERROR_38 cannot disable version a table modified in non-LIVE workspaces

Cause: DisableVersioning failed because the table had been modified in non-`LIVE` workspaces.

Action: Remove or merge all workspaces that have modified this table. Otherwise, use the `FORCE` option of DisableVersioning.

WM_ERROR_39 cannot drop tables involved in foreign key relationships

Cause: An attempt to drop a database table failed because it was involved in a foreign key relationship with a version-enabled table.

Action: Consult the WM_RIC_INFO view and version-disable the table that is involved in the foreign key relationship before attempting to drop the table.

WM_ERROR_40 only grantor of a privilege may revoke it

Cause: An attempt was made to revoke a privilege that was not granted by the current user.

Action: Do not attempt to revoke this privilege.

WM_ERROR_41 unable to set workspace lock mode

Cause: SetWorkspaceLockModeOn failed because the workspace contained modifications from one or more version-enabled tables.

Action: Use SetLockingOn to set the session's lock mode. Use SetWorkspaceLockModeOn only for those workspaces that have not yet modified any version-enabled tables.

WM_ERROR_42 cannot version enable tables owned by SYS

Cause: EnableVersioning failed because Workspace Manager can only version-enable tables owned by users other than `SYS`.

Action: Do not invoke EnableVersioning on tables owned by `SYS`.

WM_ERROR_43 A continually refreshed workspace must be a leaf workspace.

Cause: CreateWorkspace failed because the workspace to be created was to be a child of a continually refreshed workspace. Continually refreshed workspaces carry with them the restriction that they must be leaf workspaces.

Action: Do not create a workspace off of a continually refreshed workspace.

WM_ERROR_44 insufficient privileges to merge data

Cause: The merge operation failed because the user does not have both `ACCESS` and `MERGE` privileges on the workspace on which it was invoked; or, in a multiparent workspace environment, the user does not have both `ACCESS` and `MERGE` privileges on the non-root workspaces and `ACCESS` privilege on the root workspace of the multiparent workspace graph.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges.

WM_ERROR_45 merge operation requires ACCESS privileges on the parent workspace

Cause: The operation invoked failed because it required `ACCESS` privileges on the parent workspace of the workspace it was invoked on.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges on the parent workspace.

WM_ERROR_46 commit/rollback open short transactions before calling CommitResolve

Cause: CommitResolve failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_47 commit/rollback open short transactions before calling CompressWorkspace

Cause: CompressWorkspace failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_48 commit/rollback open short transactions before calling CompressWorkspaceTree

Cause: CompressWorkspaceTree failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_49 commit/rollback open short transactions before calling DeleteSavepoint

Cause: DeleteSavepoint failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard data

WM_ERROR_50 commit/rollback open short transactions before calling GotoWorkspace

Cause: GotoWorkspace failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_51 commit/rollback open short transactions before calling RollbackResolve

Cause: RollbackResolve failed because open database transactions existed.

Action: The user with the open database transaction should issue a standard database commit or rollback.

WM_ERROR_52 CommitResolve can be called only after BeginResolve has been invoked

Cause: CommitResolve failed because BeginResolve was not previously invoked.

Action: To resolve conflicts, first issue a BeginResolve, then issue ResolveConflicts, and finally issue CommitResolve.

WM_ERROR_53 CompressWorkspace operation requires ACCESS and MERGE privileges on the workspace

Cause: The operation invoked failed because it required both `ACCESS` and `MERGE` privileges on the workspace on which it was invoked.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges on the workspace.

WM_ERROR_54 CompressWorkspace operation requires ACCESS privilege on the workspace

Cause: The operation invoked failed because it required `ACCESS` privileges on the workspace on which it was invoked.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges on the workspace.

WM_ERROR_55 conflicts detected for workspace: *'string'* in table: *'string'*

Cause: An operation failed because there were conflicts detected for the table.

Action: To resolve conflicts, first issue a BeginResolve, then issue ResolveConflicts, and finally issue CommitResolve. Otherwise, refrain from calling this operation.

WM_ERROR_56 conflicts detected for workspace: *'string'* in table: *'string'*.*'string'*

Cause: An operation failed because there were conflicts detected for the table.

Action: To resolve conflicts, first issue a BeginResolve, then issue ResolveConflicts, and finally issue CommitResolve. Otherwise, refrain from calling this operation.

WM_ERROR_57 CreateSavepoint operation requires ACCESS privileges on the workspace

Cause: The operation invoked failed because it required `ACCESS` privileges on the workspace on which it was invoked.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges on the workspace.

WM_ERROR_58 RemoveWorkspace operation requires ACCESS and REMOVE privileges on the workspace

Cause: The operation invoked failed because it required both `ACCESS` and `REMOVE` privileges on the workspace on which it was invoked.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges on the workspace.

WM_ERROR_59 entry already exists in spatial metadata table for *'string'*_WM

Cause: EnableVersioning of the spatial table failed because the spatial metadata table already contained an entry for the table.

Action: Contact Oracle Support Services.

WM_ERROR_60 user must call BeginResolve or have WM_ADMIN_ROLE to invoke RollbackResolve

Cause: RollbackResolve can be successful only if the user invoking it also invoked BeginResolve, or if the user invoking it had the `WM_ADMIN_ROLE` role.

Action: Ensure that the invoking user has the required privileges before attempting to invoke RollbackResolve. Otherwise, have the user that issued the BeginResolve operation invoke RollbackResolve.

WM_ERROR_61 versioned objects have to be version disabled before being dropped

Cause: An attempt to drop a database table or view failed because it was associated with a version-enabled table.

Action: version-disable the table first. In the case of a view, version-disable the table associated with the view.

WM_ERROR_62 versioned table: *'string'* does not exist

Cause: The operation failed because the table passed in as input did not exist or was not version-enabled.

Action: Pass in an existing, version-enabled table as input.

WM_ERROR_63 need to be on the latest version to create a continually refreshed workspace.

Cause: CreateWorkspace failed because the session was in a non-`LATEST` version of the workspace.

Action: Ensure that the current session is on the `LATEST` version in the workspace by using the GotoWorkspace or GotoSavepoint procedures.

WM_ERROR_64 need to be on the latest version to create a savepoint

Cause: CreateSavepoint failed because the session was in a non-`LATEST` version of the workspace.

Action: Ensure that the current session is on the `LATEST` version in the workspace by using the GotoWorkspace or GotoSavepoint procedures.

WM_ERROR_65 grantor and grantee may not be the same user

Cause: An attempt was made to grant or revoke a privilege from or to the same user.

Action: Do not attempt to grant or revoke privileges from or to the same user. Privileges can only be granted or revoked between different users.

WM_ERROR_66 unable to version enable this table with history option

Cause: An attempt was made to version-enable a table with `VIEW_WO_OVERWRITE` or `VIEW_W_OVERWRITE` option and the cumulative length of the names of the primary key columns was greater than 600.

Action: Rename the primary key columns.

WM_ERROR_67 grantee must be an existing user, an existing role or PUBLIC

Cause: A grant operation was attempted with an invalid grantee parameter.

Action: The grantee may only be an existing user, role, or `PUBLIC`. Verify correct spelling of the grantee parameter.

WM_ERROR_68 input parameter grant_option must be "YES" or "NO"

Cause: An attempt was made to invoke the GrantWorkspacePriv or GrantSystemPriv procedure with an invalid input parameter.

Action: Ensure that the valid parameters are passed to the GrantWorkspacePriv or GrantSystemPriv procedure. The `grant_option` parameter may only be `YES` or `NO`.

WM_ERROR_69 invalid in_date time for GotoDate

Cause: GotoDate was invoked with an `in_date` time less than the create time of the current workspace.

Action: The `in_date` parameter for GotoDate must be greater than or equal to the create time for the current workspace.

WM_ERROR_70 insufficient privileges on *'string'* to lock rows

Cause: An attempt was made to invoke the LockRows procedure on a versioned table without the required privileges on the table.

Action: Ensure that the invoking user has the required privileges before invoking the operation. The lockRows procedure requires the invoking user to have SELECT, INSERT, UPDATE and DELETE privileges on the versioned table.

WM_ERROR_71 insufficient privileges on *'string'* to unlock rows

Cause: An attempt was made to invoke the UnlockRows procedure on a versioned table without the required privileges on the table.

Action: Ensure that the invoking user has the required privileges before invoking the operation. The UnlockRows procedure requires the invoking user to have `SELECT`, `INSERT`, `UPDATE` and `DELETE` privileges on the versioned table.

WM_ERROR_72 insufficient privileges on *'string'.'string'*

Cause: An attempt was made to invoke the ResolveConflicts procedure on a versioned table without the required privileges on the table.

Action: Ensure that the invoking user has the required privileges before invoking the operation. The ResolveConflicts procedure requires the invoking user to have `SELECT`, `INSERT`, `UPDATE` and `DELETE` privileges on the versioned table being conflict resolved.

WM_ERROR_73 insufficient privileges to ACCESS the workspace: *'string'*

Cause: An attempt was made to invoke an operation that required the specified privileges on the input workspace.

Action: Ensure that the invoking user has the required privileges before invoking the operation. Privileges can be granted using the GrantWorkspacePriv or the GrantSystemPriv procedures. Use the function GetPrivs to see which privileges you have on a workspace.

WM_ERROR_74 insufficient privileges to ACCESS the parent workspace: *'string'*

Cause: An attempt was made to invoke an operation that required the specified privileges on the parent workspace of the input workspace.

Action: Ensure that the invoking user has the required privileges before invoking the operation. Privileges can be granted using the grantWorkspacePriv or the grantSystemPriv procedures. Use the function GetPrivs to see which privileges you have on a workspace.

WM_ERROR_75 insufficient privileges to create a child workspace of: *'string'*

Cause: An attempt was made to invoke the CreateWorkspace procedure from a workspace without the required privileges on the workspace.

Action: Ensure that the invoking user has the required privileges before invoking the operation. The invoking user must have `CREATE` privileges on a workspace to be allowed to create a workspace off of it. Privileges can be granted using the grantWorkspacePriv or the grantSystemPriv procedures. Use the function GetPrivs to see which privileges you have on a workspace.

WM_ERROR_76 insufficient privileges to grant *'string'*

Cause: An attempt was made to invoke the GrantWorkspacePriv or GrantSystemPriv procedure without the required privileges to do so.

Action: Ensure that the invoking user has the required privileges to grant the privilege. A user needs to have been granted a privilege with the `GRANT` option to be able to grant it to others.

WM_ERROR_77 insufficient privileges on the versioned table *'string'*

Cause: An attempt was made to invoke a Workspace Manager procedure without the required privileges on the versioned table.

Action: Ensure that the invoking user has the required privileges before invoking the operation. All Workspace Manager workspace wide operations require the invoking user to have `SELECT`, `INSERT`, `UPDATE` and `DELETE` privileges on all versioned tables that were modified in the input workspace.

WM_ERROR_78 insufficient privileges on the versioned table: *'string'.'string'*

Cause: An attempt was made to invoke a Workspace Manager procedure without the required privileges on the versioned table.

Action: Ensure that the invoking user has the required privileges before invoking the operation. All Workspace Manager workspace wide operations require the invoking user to have `SELECT`, `INSERT`, `UPDATE` and `DELETE` privileges on all versioned tables that were modified in the input workspace.

WM_ERROR_79 WM internal error [*'string'*]

Cause: A Workspace Manager operation resulted in an internal error.

Action: Contact Oracle Support Services to resolve the issue.

WM_ERROR_80 invalid "hist" parameter for EnableVersioning

Cause: An invalid value was specified for the `hist` parameter of procedure EnableVersioning.

Action: Valid values for the `hist` parameter are `NONE`, `VIEW_W_OVERWRITE`, and `VIEW_WO_OVERWRITE`.

WM_ERROR_81 invalid column name specified in the where-clause

Cause: An attempt was made to invoke a Workspace Manager procedure with an invalid `where_clause` parameter as input.

Action: Ensure that the input `where_clause` parameter contains only valid column names and has proper syntax.

WM_ERROR_82 invalid privilege type: *'string'* was specified as input

Cause: An attempt was made to invoke a Grant or Revoke Privilege procedure with an invalid priv_type parameter.

Action: Ensure that the valid parameters are passed to the Grant or Revoke Privilege operation. The valid privilege types are: `ACCESS_WORKSPACE`, `MERGE_WORKSPACE`, `ROLLBACK_WORKSPACE`, `REVOKE_WORKSPACE`, and `CREATE_WORKSPACE`.

WM_ERROR_83 invalid user specified for the freezewriter parameter

Cause: The FreezeWorkspace procedure was called with an invalid `freezewriter` parameter.

Action: Ensure that the freezewriter parameter passed in as input to the FreezeWorkspace procedure is an existing database user.

WM_ERROR_84 invalid value for lock_mode - "E" or "S" expected

Cause: An invalid value was specified for the `lock_mode` parameter of procedure LockRows.

Action: Specify a valid value for lock_mode. The valid values for `lock_mode` are `E` and `S` (default is `E`).

WM_ERROR_85 invalid value for the lock_mode argument - "E", "S" or "ES" expected

Cause: An invalid value has been specified for the `lock_mode` parameter (fifth parameter) of procedure UnlockRows.

Action: Specify a valid value for lock_mode. The valid values for `lock_mode` are `E`, `S`, and `ES` (default is `ES`).

WM_ERROR_86 invalid value for the all_or_user argument - "ALL" or "USER" expected

Cause: An invalid value has been specified for the `all_or_user` parameter (fourth parameter) of procedure UnlockRows.

Action: Specify a valid value for `all_or_user`. The valid values for `all_or_user` are `ALL` and `USER` (default is `USER`).

WM_ERROR_87 IsWorkspaceOccupied cannot be used for "LIVE" workspace

Cause: A user attempted to invoke IsWorkspaceOccupied on the `LIVE` workspace.

Action: Workspace Manager allows IsWorkspaceOccupied to be invoked only on workspaces other than `LIVE`. The `LIVE` workspace is the default workspace for any session that is connected and Workspace Manager does not monitor users in the `LIVE` workspace. Do not invoke this method on the `LIVE` workspace.

WM_ERROR_88 IsWorkspaceOccupied requires ACCESS privilege on the workspace

Cause: IsWorkspaceOccupied was invoked for a workspace on which the user did not have `ACCESS` privilege.

Action: IsWorkspaceOccupied can only be invoked for a workspace on which the user has `ACCESS` privilege.

WM_ERROR_89 "LIVE" workspace can be frozen only in (READ_ONLY, 1WRITER, 1WRITER_SESSION, WM_ONLY) modes

Cause: An attempt was made to Freeze the `LIVE` workspace in `NO_ACCESS` mode. Workspace Manager does not support this mode for the `LIVE` workspace.

Action: Use one of (`READ_ONLY`, `1WRITER`, `1WRITER_SESSION`, `WM_ONLY`) modes to freeze the `LIVE` workspace.

WM_ERROR_90 lock operation requires ACCESS privilege on the parent workspace

Cause: LockRows was invoked for a workspace whose parent workspace was not accessible to the user.

Action: The user requires `ACCESS` privilege on the parent workspace of the workspace for which lockRows in invoked.

WM_ERROR_91 lock operation requires ACCESS privilege on the workspace

Cause: LockRows was invoked for a workspace on which the user did not have ACCESS privilege.

Action: The user requires `ACCESS` privilege on the workspace for which LockRows in invoked.

WM_ERROR_92 cannot *'string'* because locking is on and row is already versioned

Cause: An attempt to place a shared or exclusive lock on a row in a versioned table failed because the row was already versioned in some other workspace.

Action: To update, delete, or insert a row that was already versioned in some other workspace, the current session must turn locking off. Consult the table's _ LOCK view to see which rows in this table are locked.

WM_ERROR_93 The multi-workspace view requires ACCESS privilege on the workspace : *'string'*

Cause: SetMultiWorkspaces was invoked with the name of a workspace on which the user did not have `ACCESS` privilege.

Action: Names of only those workspaces for which the user has `ACCESS` privilege can be passed to SetMultiWorkspaces.

WM_ERROR_94 non-existent versioned table: *'string'.'string'*

Cause: This operation was invoked on a non-version-enabled table.

Action: This operation can only be invoked on a version-enabled table. Verify that the table is version-enabled. The *xxx*_VERSIONED_TABLES views show all the versioned tables in the database.

WM_ERROR_95 null savepoint name passed in as input

Cause: An attempt was made to invoke a Workspace Manager procedure with a null savepoint name parameter.

Action: Pass in a non-null savepoint parameter for this procedure to succeed

WM_ERROR_96 null workspace name passed in as input

Cause: A null value was passed in as input to a Workspace Manager operation

Action: Pass in a non-null workspace parameter for this operation to succeed

WM_ERROR_97 null table name parameter passed in

Cause: MergeTable was invoked with a null table name.

Action: Specify the name of the version-enabled table to be merged.

WM_ERROR_98 Number of workspaces in the multi-workspace view cannot be greater than 8.

Cause: SetMultiWorkspaces was invoked with more than 8 workspace names.

Action: Invoke SetMultiWorkspaces with 8 or fewer workspace names.

WM_ERROR_99 WM failed to install - system triggers not properly created

Cause: One of the Workspace Manager generated database triggers was not created properly.

Action: Contact Oracle Support Services to resolve the issue.

WM_ERROR_100 *'string'* is both parent and child tables of referential integrity constraints

Cause: An attempt was made to version-enable a table that was both parent and child tables of referential integrity constraints.

Action: Version-enable both tables (specifying a comma-delimited list of table names) in the same call to the EnableVersioning procedure.

WM_ERROR_101 child table must be version enabled

Cause: An attempt was made to version-enable the parent table of a referential integrity constraint whose child table was not version-enabled.

Action: Before version-enabling a table, all tables that are child tables of referential integrity constraints (excluding self referential integrity constraints) that have this table as the parent table must be version-enabled.

WM_ERROR_102 cannot version enable this table

Cause: An attempt was made to version-enable a table that was the child table of a non-self referential integrity constraint with the CASCADE option and that had a self referential integrity constraint defined on it.

Action: If application semantics permit, change the CASCADE option to the RESTRICT option.

WM_ERROR_103 cannot version disable this table with force option

Cause: The FORCE option was specified while version-disabling a table that was the parent table of a referential integrity constraint.

Action: The FORCE option cannot be specified while version-disabling a table that is the parent table of a referential integrity constraint. Commit or roll back all changes done on this table in non-`LIVE` workspaces and then version-disable the table without the FORCE option.

WM_ERROR_104 cannot version disable this table

Cause: An attempt has been made to version-disable the child table of a referential integrity constraint whose parent table was still version-enabled.

Action: Version-disable the parent table before version-disabling this table.

WM_ERROR_105 owner of constraint (*'string'.'string'*) must have select privilege on the parent

Cause: An attempt was made to version-enable a table that was the child table of a referential integrity constraint with another table, and the owner of the table to be version-enabled did not have `SELECT` privilege on the parent table.

Action: Workspace Manager requires that before version-enabling the child table of a integrity constraint, the child table owner must have `SELECT` privilege on the parent table. Grant the required privilege before version-enabling.

WM_ERROR_106 select and delete privileges needed on the child of constraint (*'string'.'string'*)

Cause: An attempt was made to version-enable a table that was the parent table of a referential integrity constraint with another table and the owner of the table to be version-enabled did not have `SELECT` or `DELETE` privilege on the child table.

Action: Workspace Manager requires that before version-enabling the parent table of a referential integrity constraint, the parent table owner must have `SELECT` and `DELETE` privileges on the child table. Grant `SELECT` and `DELETE` privileges on the child table to the owner of the table being version-enabled.

WM_ERROR_107 select privilege needed on the child of constraint (*'string'.'string'*)

Cause: An attempt was made to version-enable a table that was the parent table of a referential integrity constraint with another table and the owner of the table to be version-enabled did not have `SELECT` privilege on the child table.

Action: Workspace Manager requires that before version-enabling the parent table of a referential integrity constraint, the parent table owner must have `SELECT` and `DELETE` privileges on the child table. Grant `SELECT` and `DELETE` privileges on the child table to the owner of the table being version-enabled.

WM_ERROR_108 triggering event *'string'* not allowed

Cause: A triggering event of the form "insert OR update OR delete" was specified.

Action: Drop the trigger and re-create separate triggers (with identical bodies) for insert, update, and delete.

WM_ERROR_109 a table with unique constraints cannot be version enabled

Cause: An attempt was made to version-enable a table that had unique constraints defined on it.

Action: Drop the unique constraint on this table before version-enabling it. If the table needs to have a index for performance reasons, create a non-unique index on the relevant set of columns. Oracle will use the created index to optimize queries on the version-enabled table whenever appropriate.

WM_ERROR_112 insufficient privileges to refresh data

Cause: The refresh operation failed because the user does not have both `ACCESS` and `MERGE` privileges on the child workspace on which it was invoked; or, in a multiparent workspace environment, the user does not have both `ACCESS` and `MERGE` privileges on the non-root workspaces and `ACCESS` privilege on the root workspace of the multiparent workspace graph.

Action: Use the GetPrivs function to ensure that the user invoking this operation has the required privileges.

WM_ERROR_113 refresh operation requires ACCESS privileges on the parent workspace

Cause: An attempt was made to invoke RefreshTable or RefreshWorkspace and the user did not have `ACCESS` privilege on the parent workspace.

Action: Ensure that the invoking user has `ACCESS` privilege on the parent workspace before invoking RefreshTable or RefreshWorkspace. Privileges can be granted using the GrantWorkspacePriv or the GrantSystemPriv procedures. Use the GetPrivs function to see which privileges the current user has on a workspace.

WM_ERROR_114 Continually refreshed workspaces can be created only off of the "LIVE" workspace

Cause: An attempt was made to create a continually refreshed workspace off a non-LIVE workspace.

Action: Workspace Manager only supports creation of continually refreshed workspaces off the LIVE workspace. The user needs to be in the LIVE workspace before invoking CreateWorkspace for creating a continually refreshed workspace.

WM_ERROR_115 ResolveConflicts can be called only after BeginResolve is invoked

Cause: The ResolveConflicts procedure was invoked without calling the BeginResolve procedure first.

Action: Ensure that BeginResolve is invoked by the current user on a workspace before invoking ResolveConflicts for a version-enabled table in that workspace. (See the Resolving Conflicts section of the User Guide for details on the process of resolving conflicts for version-enabled tables.)

WM_ERROR_116 rollback operation requires ACCESS and ROLLBACK privileges on the workspace

Cause: An attempt was made to invoke RollbackTable or RollbackWorkspace and the user did not have ACCESS or ROLLBACK privilege on the workspace.

Action: Ensure that the invoking user has ACCESS and ROLLBACK privileges on the workspace before invoking RollbackTable or RollbackWorkspace. Privileges can be granted using the GrantWorkspacePriv or the GrantSystemPriv procedures. Use the function GetPrivs to see which privileges the current user has on a workspace.

WM_ERROR_117 RollbackResolve can be called only after BeginResolve has been invoked

Cause: RollbackResolve procedure was invoked without calling the BeginResolve procedure first.

Action: Ensure that BeginResolve is invoked before you invoke RollbackResolve. (See the Resolving Conflicts section of the User Guide for details on the process of resolving conflicts for version-enabled tables.)

WM_ERROR_118 savepoint names may not be longer than 30 characters

Cause: An attempt was made to create a savepoint whose name had more than 30 characters.

Action: Choose a shorter savepoint name.

WM_ERROR_119 savepoint names may not begin with \"ICP-\"

Cause: An attempt was made to create a savepoint whose name began with the string "ICP-".

Action: Choose a savepoint name that does not begin with the string "ICP-". Workspace Manager reserves names starting with "ICP-" for naming implicit savepoints.

WM_ERROR_120 savepoint: *'string'* already exists in workspace: *'string'*

Cause: An attempt was made to create a savepoint with the same name as an existing savepoint. Workspace Manager savepoint names must be unique within a workspace.

Action: Choose another savepoint name.

WM_ERROR_121 savepoint: *'string'* does not exist in workspace: *'string'*

Cause: An attempt was made to invoke a Workspace Manager operation on a savepoint that did not exist in the specified workspace.

Action: Verify that the savepoint name is spelled correctly and that it exists in the specified workspace. Workspace names and savepoint names are case-sensitive.

WM_ERROR_122 workspace *'string'* does not exist

Cause: An attempt was made to invoke a Workspace Manager operation on a workspace that did not exist.

Action: Pass in an existing workspace name as input. Workspace names and savepoint names are case-sensitive.

WM_ERROR_123 workspace *'string'* is currently frozen in *'string'* mode

Cause: The user invoked a Workspace Manager operation that cannot proceed because the specified workspace has been frozen in the specified mode.

Action: Wait for the database session that holds the lock to release the lock. See the Workspace Manager documentation for a description of the Workspace Manager operations allowed for different workspace freeze modes. Consult the *xxx*_WM_WORKSPACES view to see which workspaces are currently frozen.

WM_ERROR_124 workspace name may not be "BASE"

Cause: A user attempted to create a workspace with the name `BASE`.

Action: Workspace Manager considers "BASE" to be a reserved keyword. Therefore, Workspace Manager does not allow the workspace to be named `BASE`. Choose another workspace name.

WM_ERROR_125 workspace name may not be "LIVE"

Cause: A user attempted to create a workspace with the name `LIVE`.

Action: Workspace Manager considers "LIVE" to be a reserved keyword. Therefore, Workspace Manager does not allow new workspaces to be named `LIVE`. Choose another workspace name.

WM_ERROR_126 workspace name may not exceed 30 characters

Cause: A user attempted to create a workspace with the workspace name length greater than 30 characters.

Action: Workspace Manager limits workspace names to 30 characters. Choose a shorter workspace name.

WM_ERROR_127 workspace: *'string'* is already being conflict resolved by user: *'string'*

Cause: A user attempted to invoke BeginResolve on a workspace that was already being conflict resolved by some other user.

Action: Workspace Manager allows only one user to resolve conflicts for a workspace at the same time. Wait until the user is finished resolving conflicts in the workspace and verify that the conflicts you are attempting to resolve still exist. Use the *xxx*_WORKSPACES views to check on the current resolve status of the workspace.

WM_ERROR_128 workspace: *'string'* is temporarily frozen in an internal mode for a *'string'* operation

Cause: A user attempted to invoke a Workspace Manager operation on a workspace that was frozen internally for another Workspace Manager operation.

Action: Workspace Manager acquires internal freezes on workspaces for the duration of various Workspace Manager operations. Wait until Workspace

Manager releases the internal freeze on the workspace. See the User Guide for details on the freezes that Workspace Manager acquires for various workspace-wide operations. Use the *xxx*_WORKSPACES views to check on the current freeze status of the workspace.

WM_ERROR_129 table *'string'* does not exist

Cause: An attempt was made to invoke a Workspace Manager operation on a table that did not exist.

Action: Verify that the table exists.

WM_ERROR_130 table *'string'* has been modified in an open transaction

Cause: An attempt was made to execute a Workspace Manager operation that required that there be no open database transactions on the table.

Action: Ensure that all open database transactions on the specified table have completed before invoking the Workspace Manager operation.

WM_ERROR_131 table *'string'* is already version enabled

Cause: The specified table is already version-enabled.

Action: To version-disable it, execute the DisableVersioning procedure. The *xxx*_VERSIONED_TABLES views show all the versioned tables in the database.

WM_ERROR_132 table *'string'* is not version enabled

Cause: This operation can only be invoked on a version-enabled table.

Action: Verify that the specified table is version-enabled. The *xxx*_VERSIONED_TABLES views show all the versioned tables in the database.

WM_ERROR_133 table *'string'* needs to have a primary key

Cause: An attempt was made to version-enable a table that did not have a primary key defined on it. Workspace Manager requires that a primary key exist on a version-enabled table.

Action: Add a primary key constraint on this table before version-enabling it.

WM_ERROR_134 table *'string'* is already being version disabled

Cause: An attempt was made to version-disable a table which another transaction was in the process of version-disabling.

Action: Wait until the other transaction finishes version-disabling the specified table. The *xxx*_VERSIONED_TABLES views show all the versioned tables in the database.

WM_ERROR_135 table *'string'* is being version enabled

Cause: An attempt was made to version-enable a table which another transaction was in the process of version-enabling.

Action: Wait until the other transaction finishes version-enabling the specified table. The *xxx*_VERSIONED_TABLES views show all the versioned tables in the database.

WM_ERROR_136 table names are limited to 25 characters

Cause: An attempt was made to version-enable a table whose name was longer than 25 characters, or to perform another action (such as an export from a staging table) where the table name was longer than 25 characters.

Action: Rename the table to a shorter table name.

WM_ERROR_138 table: *'string'* is in use in other sessions

Cause: An attempt to version-disable a table has failed due to the existence of database transaction locks on the table.

Action: To successfully version-disable this table, verify that there are no database transaction locks on the table.

WM_ERROR_140 invalid value for FreezeMode parameter

Cause: An attempt was made to invoke the FreezeWorkspace procedure with an invalid `freezemode` parameter.

Action: The freezemode parameter for the FreezeWorkspace procedure must be one of (`NO_ACCESS`, `READ_ONLY`, `1WRITER`, `1WRITER_SESSION`, `WM_ONLY`). Ensure that FreezeWorkspace is invoked with the correct parameters.

WM_ERROR_141 the parameter freezewriter can be non-null only for the 1WRITER mode

Cause: An attempt was made to invoke the FreezeWorkspace procedure with an invalid `freezewriter` parameter.

Action: The `freezewriter` parameter for the FreezeWorkspace procedure can be non-null only when the `freezemode` parameter is `1WRITER`. Ensure that FreezeWorkspace is invoked with the correct parameters.

WM_ERROR_142 the keep parameter must be one of ("PARENT","CHILD","BASE")

Cause: The ResolveConflicts procedure was called with an invalid `keep` parameter.

Action: Ensure that the `keep` parameter to the ResolveConflicts procedure is one of (`CHILD`,`PARENT`,`BASE`). This parameter is not case-sensitive. See the Resolving Conflicts section of the Workspace Manager documentation for details on the process of conflict resolution.

WM_ERROR_143 the "LIVE" workspace can only be rolled back to a savepoint

Cause: An attempt was made to rollback the entire `LIVE` workspace. Workspace Manager only supports the RollbackToSP operation for the `LIVE` workspace.

Action: Use RollbackToSP to achieve the desired result.

WM_ERROR_144 the "LIVE" workspace cannot be merged

Cause: A user attempted to invoke MergeWorkspace on the `LIVE` workspace.

Action: Workspace Manager disallows commit of the `LIVE` workspace. Do not invoke MergeWorkspace on the `LIVE` workspace.

WM_ERROR_145 the "LIVE" workspace cannot be removed

Cause: A user attempted to invoke RemoveWorkspace on the `LIVE` workspace.

Action: To rollback changes in the `LIVE` workspace, use the RollbackToSP operation. To remove descendants to the `LIVE` workspace, use the RemoveWorkspace operation on the child workspaces.

WM_ERROR_147 the "LIVE" workspace cannot be refreshed

Cause: A user attempted to invoke RefreshWorkspace on the `LIVE` workspace.

Action: Workspace Manager disallows the Refresh operation on the `LIVE` workspace. Do not invoke RefreshWorkspace on the `LIVE` workspace.

WM_ERROR_148 the lock mode is currently not set for this session

Cause: The user invoked a SetLockingOFF operation without having called SetLockingON earlier in the current session.

Action: A user can only execute SetLockingOff if the user had called SetLockingOn in the session. To see what the current lock mode is, use the GetLockMode function.

WM_ERROR_149 the lock mode must be one of ("C","E","S")

Cause: The user invoked a SetLockingON operation with an invalid `lockmode` parameter.

Action: Use a lock mode that Workspace Manager currently supports: `E` (exclusive) or `S` (shared). For a discussion of the differences and similarities between these two modes, see the Workspace Manager documentation.

WM_ERROR_150 the lock mode is already set for workspace: *'string'*

Cause: An attempt was made to invoke the SetWorkspaceLockModeON operation for a workspace whose lock mode has already been set.

Action: To change the lock mode for a workspace, use the SetWorkspaceLockModeOFF procedure to first unset the lock mode.

WM_ERROR_151 the parent workspace *'string'* is currently frozen in *'string'* mode

Cause: An attempt was made to invoke a Workspace Manager operation that required the specified parent workspace to be unfrozen.

Action: Wait for the workspace to be unfrozen before invoking the Workspace Manager operation. The workspace can be unfrozen by the owner of the workspace or by a user with the `WM_ADMIN_ROLE` using the UnfreezeWorkspace procedure.

WM_ERROR_152 the workspace *'string'* is not a leaf workspace

Cause: A workspace wide operation was invoked on an intermediate workspace. Workspace Manager supports this operation only on leaf workspaces. A leaf workspace is one that does not have any descendants.

Action: Invoke the operation only on leaf workspaces.

WM_ERROR_153 the workspace: *'string'* has savepoints in the branch specified

Cause: A CompressWorkspace or CompressWorkspaceTree operation resulted in this internal error.

Action: Contact Oracle Support Services to resolve the issue.

WM_ERROR_154 the workspaceLockMode for *'string'* has been set to *'string'* without override

Cause: An attempt was made to invoke the SetLockingON or the SetLockingOFF procedure while the current session was in a workspace whose lock mode was set without override.

Action: The lock mode can be changed by the current session only if the session is in a workspace whose lock mode has not been set or if the session is in a workspace whose lock mode has been set with the override option. Privileged users can change the lock mode for a workspace using the SetWorkspaceLockModeON and the SetWorkspaceLockModeOFF procedures.

WM_ERROR_155 the where-clause can involve only primary key columns

Cause: An attempt was made to invoke a Workspace Manager operation with an invalid `where_clause` parameter as input.

Action: Ensure that the input `where_clause` parameter contains only valid column names and has proper syntax. The `where_clause` parameter for this

Workspace Manager operation can contain only columns that are part of the primary key.

WM_ERROR_156 there are active sessions in the workspace: *'string'*

Cause: An attempt was made to invoke a Workspace Manager operation that required that there be no sessions in the specified workspace (or, in a multiparent workspace environment, in any non-root workspaces in the multiparent workspace graph).

Action: To successfully invoke the Workspace Manager operation on the specified workspace, ensure that there are no sessions in the workspace or workspaces involved. Privileged users can view all the sessions in a workspace using the DBA_WORKSPACE_SESSIONS view.

WM_ERROR_157 there are sessions on non-latest versions in the workspace: *'string'*

Cause: An attempt was made to invoke CompressWorkspace with some sessions in the workspace being on non-`LATEST` savepoints in the workspace. CompressWorkspace requires that all sessions in the specified workspace be on the `LATEST` version of the workspace.

Action: All sessions in the specified workspace must either go to another workspace using GotoWorkspace or must go to the `LATEST` savepoint using GotoSavepoint. Privileged users can view all the sessions in a workspace using the DBA_WORKSPACE_USERS view.

WM_ERROR_158 this procedure cannot be invoked on the "LIVE" workspace

Cause: An attempt was made to invoke a Workspace Manager procedure on the `LIVE` workspace.

Action: Invoke this Workspace Manager procedure only on non-`LIVE` workspaces.

WM_ERROR_159 unable to exclusively lock table: *'string'*.*'string'*

Cause: An attempt to version-disable a table failed due to the existence of database transaction locks on the table.

Action: To successfully version-disable this table, verify that there are no database transaction locks on the table.

WM_ERROR_160 unable to grant/revoke appropriate privileges

Cause: An attempt to version-disable a table failed due to an internal error in granting or revoking appropriate privileges on the table being version-enabled.

Action: Contact Oracle Support Services to resolve the issue.

WM_ERROR_161 unable to lock *'string'*: *'string'* in *'string'* mode

Cause: An attempt was made to invoke a Workspace Manager operation that failed because Workspace Manager was unable to acquire an exclusive lock on the specified resource.

Action: The specified resource may have been locked by some other database session performing a Workspace Manager operation. Wait for the lock on the resource to be released before proceeding with the Workspace Manager operation.

WM_ERROR_162 unlock operation requires ACCESS privilege on the workspace

Cause: The user attempted to invoke the UnlockRows operation on a workspace without `ACCESS` privileges on the workspace.

Action: The UnlockRows operation requires ACCESS privileges on the workspace. Invoke the UnlockRows operation only on workspaces that you have ACCESS privileges for.

WM_ERROR_163 use Commit/Rollback Resolve to unfreeze workspaces being conflict resolved

Cause: A user attempted to invoke UnfreezeWorkspace on a workspace undergoing conflict resolution. This workspace was frozen due to a user having issued a BeginResolve operation on it.

Action: To unfreeze the workspace, call the CommitResolve or a RollbackResolve procedure. Only a user with WM_ADMIN_ROLE or the user who initiated the BeginResolve operation on the workspace can issue a CommitResolve or RollbackResolve call for that workspace.

WM_ERROR_164 use the RemoveWorkspaceTree procedure to drop non-leaf workspaces

Cause: A user attempted to invoke RemoveWorkspace on an intermediate workspace. To prevent the occurrence of orphaned workspaces, RemoveWorkspace can only be invoked on leaf workspaces.

Action: Execute the RemoveWorkspaceTree procedure to remove the workspace and all its descendants.

WM_ERROR_165 use the force parameter to freeze a currently frozen workspace

Cause: An attempt was made to invoke the FreezeWorkspace procedure for a workspace that was already frozen.

Action: To freeze workspaces that are already frozen, use the FreezeWorkspace procedure with the force parameter.

WM_ERROR_166 only a BeginResolve invoker or a WM_ADMIN_ROLE user can call CommitResolve

Cause: A user attempted to invoke CommitResolve without having initiated the BeginResolve operation earlier and without having the WM_ADMIN_ROLE.

Action: CommitResolve can be invoked only by the user who initiated the BeginResolve operation or by a user who has the WM_ADMIN_ROLE.

WM_ERROR_167 null lockMode parameter passed in

Cause: A user called a procedure that requires that the lockMode parameter have a non-null value.

Action: The user must pass in a non-null lockmode parameter for this operation to succeed.

WM_ERROR_168 Cannot disable workspace lockmode for continually refreshed workspaces

Cause: An attempt was made to set the workspace lock mode off for a continually refreshed workspace.

Action: Do not attempt to turn off locking for continually refreshed workspaces.

WM_ERROR_169 "WM_ADMIN_ROLE" or ownership is required to UnFreeze a workspace

Cause: UnfreezeWorkspace failed because only a user with the WM_ADMIN_ROLE role or the owner of the workspace can unfreeze a frozen workspace.

Action: Ensure that the invoking user has the required privileges before attempting to unfreeze the workspace. Otherwise, have the owner of the workspace unfreeze it.

WM_ERROR_170 The row to be locked has already been versioned

Cause: LockRows failed because the row specified to be locked was already versioned.

Action: Do not attempt to lock rows that have already been versioned. Use the `where_clause` parameter of LockRows to specify those rows that have not already been versioned.

WM_ERROR_171 WM error: *'string'*

Cause: A Workspace Manager error occurred.

Action: See the Workspace Manager documentation.

WM_ERROR_172 all version enabled tables have to be disabled before uninstalling

Cause: An attempt was made to uninstall Workspace Manager with existing version-enabled tables.

Action: Version-disable all version-enabled tables before attempting to uninstall Workspace Manager. Version-enabled tables can be disabled using the DisableVersioning procedure.

WM_ERROR_173 cannot create workspaces that are more than 30 levels deep

Cause: An attempt was made to create a workspace that is more than 30 levels in depth from the `LIVE` workspace.

Action: Do not create workspaces that are more than 30 levels in depth from the `LIVE` workspace.

WM_ERROR_174 table: *'string'* contains columns with unsupported data types

Cause: An attempt was made to version-enable a table with one or more columns with an unsupported data type.

Action: Ensure that all the columns in the table being version-enabled are of supported data types. The currently unsupported data types for version-enabled tables are: LONG and LONG RAW.

WM_ERROR_175 cannot delete implicit savepoints with dependent child workspaces

Cause: An attempt was made to invoke the DeleteSavepoint procedure on an implicit savepoint with dependent child workspaces.

Action: Ensure that the savepoint being deleted is not implicit or it does not have any child workspaces created off of it. The *xxx*_WORKSPACES views show the parent savepoints for all the workspaces in the system. Ensure that the savepoint being deleted is not a parent savepoint for some workspace.

WM_ERROR_176 A user trigger defined on *'string'.'string'* has compilation errors.

Cause: An attempt was made to version-enable a table that has a user-defined trigger with compilation errors defined on it.

Action: Ensure that all user-defined triggers on the table to be version-enabled have no compilation errors.

WM_ERROR_177 sum of length of all column names of *'string'.'string'* exceeds 8250 characters

Cause: An attempt was made to version-enable a table where the sum of the column name lengths exceeded 8250 characters.

Action: Rename some of the table's columns to reduce the sum of the column name lengths.

WM_ERROR_178 user-defined trigger body defined on *'string'.'string'* exceeds 28000 characters

Cause: An attempt was made to version-enable a table that has a user-defined trigger with a trigger body length of more than 28,000 characters defined on it.

Action: Ensure that all user-defined triggers on the table to be version-enabled have trigger body lengths that are less than 28,000 characters.

WM_ERROR_179 combination of column name sizes and user-defined trigger lengths too large

Cause: An attempt was made to version-enable a table where the length of all of the column names combined with the length of the largest trigger body defined on the table was too large.

Action: Reduce the length of the largest trigger body defined on this table, rename some of the table's columns to reduce the sum of the column name lengths, or do both.

WM_ERROR_180 table *'string'.'string'* has too many primary key columns

Cause: An attempt was made to version-enable a table that has more than 31 primary key columns.

Action: Decrease the number of primary key columns on the table to 31, at most.

WM_ERROR_181 attempt to modify a WM generated trigger

Cause: An attempt to drop or re-create a database trigger failed because that trigger was created by Workspace Manager.

Action: Do not drop or re-create this trigger.

WM_ERROR_182 attempt to modify a WM generated view

Cause: An attempt to re-create a database view failed because it was associated with a version-enabled table.

Action: Do not re-create this view. The view will automatically be dropped when the table associated with it is version-disabled.

WM_ERROR_183 reserved column name found

Cause: An attempt to version-enable the table failed because it had a column whose name started with WM$ or WM_ or had the same name as one of the following: VERSION, NEXTVER, DELSTATUS, LTLOCK, CREATETIME, or RETIRETIME.

Action: Rename the column to a different name.

WM_ERROR_184 reserved index name found

Cause: An attempt to version-enable the table failed because it had an index on it with the index name being the name of the table (to version-enabled) with the prefix _PKI$ or _TI$.

Action: Re-create the index using a different name.

WM_ERROR_185 operation disallowed on workspace *'string'* involved in a conflict resolution session

Cause: An attempt was made to execute an operation on a Workspace undergoing conflict resolution. A Workspace is under conflict resolution if BeginResolve method has been called on the workspace but CommitResolve or RollbackResolve has not been called yet.

Action: Wait for conflict resolution to either commit or rollback before trying the operation on the workspace.

WM_ERROR_186 the parameter freezewriter must be null when session_duration is true',

Cause: An attempt was made to invoke the FreezeWorkspace procedure with an invalid `freezewriter` parameter.

Action: The `freezewriter` parameter of the FreezeWorkspace procedure must be null whenever the `session_duration` parameter is TRUE. The `freezewriter` is implicitly assumed to be the currently connected session. Ensure that FreezeWorkspace is invoked with the correct parameters.

WM_ERROR_187 the parameter session_duration must be true for the 1WRITER_SESSION mod

Cause: An attempt was made to invoke the FreezeWorkspace procedure with an invalid `session_duration` parameter.

Action: The `session_duration` parameter of the FreezeWorkspace must be TRUE when attempting to freeze a workspace in 1WRITER_SESSION mode. Ensure that FreezeWorkspace is invoked with the correct parameters.

WM_ERROR_188 At least one table failed during lwDisableVersioning. Please query all_wm_vt_errors view to get the errors *'string'*

Cause: If lightweight disable-versioning fails for some reason during the upgrade or downgrade.

Action: Contact Oracle Support Services with the upgrade or downgrade log.

WM_ERROR_189 workspaces, savepoints, or versioned tables cannot be present on the IMPORT platform

Cause: The instance you are importing Workspace Manager into has some savepoints, workspaces, or version-enabled tables.

Action: Clean up savepoints, workspaces and version-enabled tables, or reinstall Workspace Manager before importing other Workspace Manager data.

WM_ERROR_190 table *'string'* is in mutating state, no structural operations can be performed

Cause: When a structural operation (for example, DisableVersioning) is in progress on a table, another structural operation (for example, BeginDDL) was invoked.

Action: Complete the ongoing operation before calling a new one.

WM_ERROR_191 LWDisableVersioning not called on the table *'string'*

Cause: Internal error during the upgrade or downgrade.

Action: Contact Oracle Support Services with the upgrade or downgrade output log.

WM_ERROR_192 At least one table failed during temporary disable-versioning *'string'*

Cause: Internal error during downgrade.

Action: Contact Oracle Support Services with downgrade output log.

WM_ERROR_194 At least one table failed during lwEnableVersioning. Please query all_wm_vt_errors view to get the errors *'string'*

Cause: Lightweight enable-versioning failed for some reason during the upgrade or downgrade.

Action: Internal error: contact Oracle Support Services with the upgrade or downgrade output log.

WM_ERROR_195 Following tables with VIEW_WO_OVERWRITE failed during recreation of PRIMARY KEY constraint *'string'*

Cause: The primary key constraint could not be re-created during the upgrade or downgrade.

Action: Internal error: contact Oracle Support Services with the upgrade or downgrade log.

WM_ERROR_196 *'string'* operation requires "FREEZE_WORKSPACE" privilege on the workspace or "FREEZE_ANY_WORKSPACE" or "WM_ADMIN_ROLE" system privilege

Cause: Insufficient privilege for freezing or unfreezing a workspace.

Action: Grant `FREEZE_WORKSPACE` privilege on the workspace, or `FREEZE_ANY_WORKSPACE` or `WM_ADMIN_ROLE` system privilege, to the user trying the operation.

WM_ERROR_197 a ddl operation is being committed on *'string'*

Cause: A DDL operation is in the process of being committed on the table.

Action: Wait until the DDL operation is complete and then retry the current operation.

WM_ERROR_198 primary key constraint of a version enabled table cannot be renamed

Cause: An attempt was made to rename the primary key constraint of the skeleton table associated with a version-enabled table.

Action: Rename the primary key constraint of the skeleton table to its original name and call the CommitDDL procedure again.

WM_ERROR_199 primary key columns cannot be added/dropped/modified/reordered for version enabled tables

Cause: An attempt was made to add, drop, modify, or reorder the primary key columns of the skeleton table associated with a version-enabled table.

Action: Restore the primary key columns to their original state and call the CommitDDL procedure again.

WM_ERROR_200 unsupported constraint *'string'* detected

Cause: A check or unique constraint was detected on the skeleton table associated with a version-enabled table.

Action: Check or unique constraints cannot be defined on a version-enabled table. Remove the constraint from the skeleton table and call the CommitDDL procedure again.

WM_ERROR_201 creation of partitioned/join indexes on version enabled tables is not supported

Cause: A partitioned or join index was detected on the skeleton table associated with a version-enabled table.

Action: Drop all partitioned or join indexes on the skeleton table and call the CommitDDL procedure again.

WM_ERROR_202 index name *'string'* is longer than 26 characters

Cause: An index name with more than 26 characters was detected on the skeleton table associated with a version-enabled table.

Action: Rename the index and call the CommitDDL procedure again.

WM_ERROR_203 enable/disable versioning or begin/commitDDL is being executed on *'string'*

Cause: Versioning is being enabled or disabled, or BeginDDL or CommitDDL is being executed, on this table.

Action: Wait until the version-enabling, version-disabling, or BeginDDL or CommitDDL operation is complete, and then retry the current operation. The operation getting executed on the table can be found by querying the ALL_WM_VERSIONED_TABLES view.

WM_ERROR_204 beginDDL not called on *'string'*

Cause: BeginDDL needs to executed on the table before the current operation can be performed.

Action: Call BeginDDL on the table and then perform the current operation again.

WM_ERROR_205 *'string'* contains data - cannot be modified

Cause: A column of the skeleton table associated with a version-enabled table was modified, and the versioned table contains non-null data in this column.

Action: Restore the column to its original state and call the CommitDDL procedure again.

WM_ERROR_206 column reordering is not supported

Cause: Columns of the skeleton table associated with a version-enabled table were reordered.

Action: Restore the columns to their original state and call the CommitDDL procedure again. Reordering of columns can be achieved by first dropping columns in a DDL session and then adding columns in a subsequent DDL session.

WM_ERROR_207 referential integrity constraint exists with a table not contained in the list of specified tables

Cause: A referential integrity constraint exists with a table not contained in the list of tables passed to the EnableVersioning or DisableVersioning procedure.

Action: Add the table to the list passed to enable or disable versioning. If you do not want to version-enable this table not contained in the list, you need to version-enable the tables one at a time.

WM_ERROR_208 cycle detected in referential integrity constraints on specified tables

Cause: A cycle exists in the referential integrity constraints between tables passed to enable or disable versioning or a new referential constraint added between two skeleton tables caused a cycle in the referential constraints.

Action: Drop one of the referential constraints in the cycle and implement it using user-defined triggers.

WM_ERROR_209 table *'string'* has been modified in non-LIVE workspaces

Cause: DisableVersioning failed because the table had been modified in non-`LIVE` workspaces.

Action: Remove or merge all workspaces that have modified this table. Otherwise, use the `FORCE` option of DisableVersioning.

WM_ERROR_210 multi-level referential integrity constraint with cascade option detected

Cause: DisableVersioning failed because the table has a cascade referential constraint with a version-enabled child table that, in turn, is the parent table of another referential constraint.

Action: Version-disable the child and parent tables together.

WM_ERROR_211 DDL is being done on *'string'*

Cause: A DDL session has already been started on the table.

Action: Wait until the previous DDL session has been committed or rolled back.

WM_ERROR_212 deferrable option not supported for integrity constraints

Cause: Deferrable option is not supported for referential integrity constraints defined on version-enabled tables.

Action: Re-create any referential constraints that have the deferrable option so that they do not have the deferrable option.

WM_ERROR_213 unsupported referential constraint with *'string'* detected

Cause: The skeleton table associated with a version-enabled table has a referential constraint with a table that is not a skeleton table.

Action: Drop this referential constraint. You can only define referential constraints between two skeleton tables.

WM_ERROR_214 *'string'* has a cascade referential constraint with a non-version enabled table

Cause: A new referential integrity constraint was added between the skeleton tables of two version-enabled tables, but the parent table already had a cascading referential constraint with a table that is not version-enabled.

Action: Drop the new referential integrity constraint between the skeleton tables and perform the current operation again.

WM_ERROR_215 A savepoint cannot be created with the name "LATEST"

Cause: A savepoint cannot be named "LATEST".

Action: Choose another name for the savepoint.

WM_ERROR_216 workspace operations are disallowed for nonwriter replication sites

Cause: A workspace operation or DML or DDL on a versioned table was attempted at a nonwriter replication site.

Action: Workspace Manager supports workspace operations and operations on versioned tables only on the writer site in a replication environment. Perform the operation on the writer site.

WM_ERROR_217 all replicated sites must have the same version of OWM installed

Cause: An attempt was made to generate replication support between sites running different versions of Workspace Manager.

Action: Replication can be set up only between sites running the same version of Workspace Manager. The version of Workspace Manager installed can be verified using the WM_INSTALLATION view.

WM_ERROR_218 workspaces, savepoints or versioned tables cannot be present on nonwriter replication sites

Cause: An attempt was made to generate replication support with one of the nonwriter sites containing workspaces, savepoints, or versioned tables.

Action: All the nonwriter sites in a replication environment are restricted from having any workspaces, savepoints, or versioned tables when replication support is generated. Ensure that all the nonwriter sites do not contain any of the previously mentioned objects. Versioned tables can be disabled using the DisableVersioning procedure. Workspaces can be dropped using the RemoveWorkspace procedure. Savepoints can be removed using the CompressWorkspaceTree procedure.

WM_ERROR_219 replication error at site '*string*': ['*string*']

Cause: A Workspace Manager operation was issued in the presence of a replication environment.

Action: Look up the error specified and take the necessary action recommended for that error.

WM_ERROR_220 Following tables failed during sentinel row adjustment '*string*'

Cause: An error occurred when Workspace Manager was being migrated from one version to another.

Action: Examine the spool file to find the Oracle error that caused this error to occur. Correct the error and enter the following SQL statement while connected AS SYSDBA:

```
SQL> EXECUTE WMSYS.OWM_MIG_PKG.AllFixSentinelVersion;
```

WM_ERROR_221 '*string*' could not be recovered from Migration Error: ['*string*']

Cause: An error occurred when Workspace Manager was being migrated from one version to another.

Action: The ALL_WM_VT_ERRORS view can be queried for more detailed information about the error. The RecoverMigratingTable or RecoverAllMigratingTables procedures can be used to recover one or more tables that were left in an inconsistent state. For more information, see Appendix B, "Migrating to Another Workspace Manager Release".

WM_ERROR_222 Following tables could not be recovered from Migration Error: '*string*'

Cause: An error occurred when Workspace Manager was being migrated from one version to another.

Action: The ALL_WM_VT_ERRORS view can be queried for more detailed information about the error. The RecoverMigratingTable or RecoverAllMigratingTables procedures can be used to recover one or more tables that were left in an inconsistent state. For more information, see Appendix B, "Migrating to Another Workspace Manager Release" in the Workspace Manager documentation.

WM_ERROR_223 WM_ADMIN_ROLE is required to invoke this procedure

Cause: A Workspace Manager operation was invoked without the requisite privileges.

Action: The WM_ADMIN_ROLE is required to invoke this specific operation. Ensure that the current user has the required privileges to invoke this operation.

WM_ERROR_224 replication error: ['*string*']

Cause: A Workspace Manager operation was invoked in the presence of a replication environment.

Action: Look up the error specified and take the necessary action recommended for that error.

WM_ERROR_225 replication error for table '*string*': ['*string*']

Cause: A Workspace Manager operation was invoked on the specified table in the presence of a replication environment.

Action: Look up the error specified for the table specified and take the necessary action recommended for that error.

WM_ERROR_227 replicated sites database versions must all be < '9.0.0.0.0' or >= '9.0.0.0.0'

Cause: An attempt was made to generate replication support between sites running incompatible versions of the database.

Action: Replication can be set up only between sites running the compatible versions of the Oracle database. All the different sites must run either a database version < '9.0.0.0.0', or all the sites must have a database installed with version >= '9.0.0.0.0'. A configuration with some sites running a database with version < '9.0.0.0.0' and some sites running a database with version >= '9.0.0.0.0' is not supported.

WM_ERROR_228 this operation is not allowed for table '*string*' with version state '*string*'

Cause: An attempt was made to invoke a workspace operation on a table with a version state that is invalid.

Action: The table on which the operation was invoked has a version state that disallows the operation from being performed. Query the ALL_WM_VERSIONED_TABLES view to look up the version state for the specified table, and see the documentation for the ALL_WM_VERSIONED_TABLES view (in Section 5.13) for a definition of the possible version state values.

WM_ERROR_229 statement *'string'* failed during EnableVersioning. Error: *string'*

Cause: Enable Versioning of the table failed due to some error. This may occur due to insufficient resources or some unexpected Oracle error.

Action: Retry the operation after fixing the cause of the error.

WM_ERROR_230 table *'string'* failed during UndoEnableVersioning/DisableVersioning. Error: *string'*

Cause: If EnableVersioning fails for some reason, an attempt is made to bring back the table to original state. This error occurs when this undo attempt fails on the partially versioned tables.

Action: Check the ALL_WM_VT_ERRORS view to see the statement that failed and the error that occurred. After fixing the cause of the error, you can version-enable the table using EnableVersioning or disable versioning on the table using DisableVersioning. (Be careful if you specify '`ignore_last_error => TRUE`' with DisableVersioning.)

WM_ERROR_231 table *'string'* failed during DisableVersioning. Error: *string'*

Cause: DisableVersioning of the table failed due to some error. This may occur due to insufficient resources or some unexpected Oracle error.

Action: See the Usage Notes for the DisableVersioning procedure for information about handling the error.

WM_ERROR_232 unique constraint *'string'.'string'* violated*'***

Cause: The DML operation or workspace operation violated the unique constraint *'string'.'string'* on a version-enabled table.

Action: Find the row that violates the constraint, and attempt the operation without the row.

WM_ERROR_233 deadlock detected when trying to acquire lock for *'string'*: *'string'*, session may have open database transactions'

Cause: The workspace operation with an `auto_commit` value of `TRUE` is invalid if the current session has an open database transaction on that workspace.

Action: Commit or roll back the current database transaction before invoking the procedure, or invoke the procedure with an `auto_commit` value of `FALSE`.

WM_ERROR_234 continually-refreshed workspaces may have only continually-refreshed workspaces as children

Cause: An attempt was made to create a workspace that is not continually refreshed as a child of a continually refreshed workspace

Action: Continually refreshed workspaces can have only continually refreshed workspaces as child workspaces.

WM_ERROR_235 invalid system parameter name or value

Cause: An invalid string was passed as a name or value for a parameter for GetSystemParameter or SetSystemParameter.

Action: Check the documentation for valid names and values of Workspace Manager system parameters.

WM_ERROR_236 system setting does not allow invocation of this procedure*'*

Cause: UnlockRows cannot be called if the Workspace Manager system parameter `NONCR_WORKSPACE_MODE` is set to `PESSIMISTIC_LOCKING`.

Action: If no data exists in workspaces that are not continually refreshed, you can set `NONCR_WORKSPACE_MODE` is set to `OPTIMISTIC_LOCKING`. To see the current Workspace Manager system parameter settings, use the WM_INSTALLATION metadata view.

WM_ERROR_237 integrity constraint (*'string'.'string'*) violated in workspace *'string'* or one of its descendants - child record found

Cause: An attempt was made to delete or update a record in a parent table of a referential integrity constraint with the RESTRICT option, and there was a matching record in the child table of the integrity constraint in the identified workspace or one of its continually refreshed descendant workspaces.

Action: Delete or roll back matching child table records first.

WM_ERROR_238 integrity constraint (*'string'.'string'*) violated in workspace *'string'* or one of its descendants - parent key not found

Cause: An attempt was made to insert or update a record in a child table of a referential integrity constraint, and there was no matching record in the parent table of the integrity constraint in the identified workspace or one its continually refreshed descendant workspaces.

Action: Insert a matching record in the parent table or roll back deleted matching parent table records first.

WM_ERROR_239 integrity constraint (*'string'.'string'*) violated in a descendant workspace - parent key not found

Cause: An attempt was made to insert or update a record in a child table of a referential integrity constraint, and there was no matching record in the parent table of the integrity constraint in a continually refreshed descendant workspace of the current workspace.

Action: Insert a matching record in the parent table or roll back deleted matching parent table records first.

WM_ERROR_240 reserved character found in workspace name

Cause: The name of a workspace contains one or more of these characters: "/", "*", ",", "$", "#"

Action: Remove these characters or replace them with valid characters.

WM_ERROR_241 system parameter *'string'* should be set to *'string'* for multiparent functionality*'***

Cause: The Workspace Manager system parameter is not set correctly to allow multiparent workspaces.

Action: Check the documentation about Workspace Manager system parameters, and be sure that any values required for multiparent workspace support are set correctly.

WM_ERROR_242 *'string'* already in ancestor hierarchy of *'string'*

Cause: The workspace that is being added as a parent workspace is already an ancestor of the (child) workspace.

Action: Ensure that a workspace is not already an ancestor of a workspace to which it is to be added as a parent workspace.

WM_ERROR_243 all workspaces under the root of multiparent graph must be same type'

Cause: In a multiparent workspace graph, all workspaces must be either continually refreshed or not continually refreshed.

Action: Ensure that the workspaces under the root of a multiparent graph are either all continually refreshed or all not continually refreshed. You can use the ChangeWorkspaceType procedure to change the workspace type between continually refreshed and not continually refreshed.

WM_ERROR_244 AddAsParentWorkspace operation requires ACCESS privilege on all nodes except root in the graph and CREATE privilege on the new parent workspace'

Cause: The user in the multiparent workspace environment does not have the specified privileges.

Action: Use the function GetPrivs to ensure that the user invoking this operation has the required privileges.

WM_ERROR_245 *'string'* is not multi-parent of *'string'*

Cause: For a RemoveWorkspaceAsParent operation, the workspace to be removed was not previously added as a parent workspace.

Action: Ensure that you have specified the correct workspace.

WM_ERROR_246 *'string'* cannot be removed because data has been versioned from the workspace branch being removed

Cause: In a multiparent workspace environment, if data has been versioned in the multiparent leaf workspace from any of the workspaces that will be removed as ancestors by this operation, the operation is not allowed.

Action: Roll back the leaf workspace to remove the versioned data from the branch being removed.

WM_ERROR_247 the multi-parent graph formed by *'string'* is not a leaf graph

Cause: In a multiparent workspace environment, there is a workspace that is a child of some non-root workspace of the multi-parent graph on which this operation was invoked.

Action: Remove all the workspaces that are children of non-root workspaces of the graph before performing this operation.

WM_ERROR_248 intermediate workspaces of a multiparent graph cannot be refreshed

Cause: In a multiparent workspace environment, only the leaf workspace of a multiparent graph can be refreshed.

Action: Ensure that you are refreshing the correct workspace.

WM_ERROR_249 primary key constraint violated for *'string.string'*

Cause: In a multiparent workspace environment, the primary key constraint for the table is violated, as viewed from the leaf workspace of the multiparent graph.

Action: Delete or roll back one of the rows that is shown as a duplicate.

WM_ERROR_250 workspace name may not be "NULL"

Cause: An attempt was made to name a workspace "NULL".

Action: Choose another name for the workspace.

WM_ERROR_251 attempt to *'string'* a row locked by 'string' in workspace *'string'* in mode "'WE"

Cause: Only the user that locked the row in `WE` mode can further edit the row in the same workspace.

Action: The row cannot be edited by the current user until the locking user removes the lock on the row.

WM_ERROR_252 attempt to *'string'* a row locked by *'string'* in mode "VE"

Cause: Only the user who locked the row in `VE` mode can further edit the row.

Action: The row cannot be edited by the current user until the locking user removes the lock on the row.

WM_ERROR_253 lock_mode of only "VE" is allowed when workspace is "NONE"

Cause: A value of `NONE` for the `workspace` parameter is permitted only with `VE` as the value for `lock_mode`.

Action: Specify the name of an existing workspace when specifying a `lock_mode` value other than `VE`.

WM_ERROR_254 cannot *'string'* because PESSIMISTIC_LOCKING is on and row is already versioned'

Cause: The DML operation cannot be executed because system parameter CR_WORKSPACE_MODE or NONCR_WORKSPACE_MODE is set to PESSIMISTIC_LOCKING and the DML operation violates the system setting.

Action: If data has not been versioned in non-LIVE workspaces, you can change the PESSIMISTIC_LOCKING setting to OPTIMISTIC_LOCKING. To see the current Workspace Manager system parameter settings, use the WM_INSTALLATION metadata view.

WM_ERROR_255 insufficient privileges [*'string'*]

Cause: An attempt was made to invoke an import or export operation without the required privileges.

Action: Ensure that the user has the required privileges before invoking the operation. To import from or export to a staging table, the user must have privileges to select from and perform DML operations on the staging table.

WM_ERROR_256 *'string'* cannot be invoked with a null *'string'* parameter

Cause: The specified parameter cannot be null.

Action: Reissue the operation using a non-null value for the specified parameter.

WM_ERROR_257 savepoint *'string'* does not exist in *'string'*'s hierarchy

Cause: The ancestor savepoint for an import operation does not exist in the hierarchy of the workspace.

Action: Specify a savepoint that is contained in the workspace's hierarchy.

WM_ERROR_258 specified system where clause is invalid [*'string'*]

Cause: An import or export operation was invoked with an invalid system WHERE clause.

Action: Ensure the compatibility of the system WHERE clause in conjunction with the parameters for the operation.

WM_ERROR_259 table *'string'* is invalid [*'string'*]

Cause: The staging table has been modified from its original state required for an import or export operation.

Action: Restore the staging table to its original state.

WM_ERROR_260 Export error [*'string'*]

Cause: Unable to perform the export operation due to the specified error.

Action: Fix the error and retry the appropriate operation.

WM_ERROR_261 Import error [*'string'*]

Cause: Unable to perform the import operation due to the specified error.

Action: Fix the error and retry the appropriate operation.

WM_ERROR_262 this parameter cannot be set to 'PESSIMISTIC_LOCKING' if data has been versioned in Non-LIVE workspaces'

Cause: This setting is not permitted if data exists in non-LIVE workspaces.

Action: If you want to use the PESSIMISTIC_LOCKING setting, ensure that there is no data versioned in non-LIVE workspaces for the workspace type (continually refreshed or not continually refreshed) for which the parameter is being set.

WM_ERROR_ 263 minimum version of workspace manager with replication support is 9.0.1.0.0

Cause: An attempt was made to set up replication support on a database with a release number less than 9.0.1.0.0.

Action: Upgrade to release 9.0.1.0.0 or higher of the database.

WM_ERROR_264 replication group *'string'* already exists on this site

Cause: An attempt was made to set up replication support with a group name that already exists on the local site.

Action: Choose a different group name.

WM_ERROR_265 replication is already set up for this site with group *'string'*

Cause: An attempt was made to set up replication support on a site where replication support already exists.

Action: Drop existing replication support before setting it up again.

WM_ERROR_266 replication support does not exist on this site

Cause: An operation related to replication was invoked without replication support existing on the local site.

Action: Set up support for replication using the DBMS_WM.GenerateReplicationSupport procedure before invoking this operation.

WM_ERROR_267 this operation has to be executed from the writer site *'string'*

Cause: An operation related to replication was invoked on a site which is not the master definition (same as writer) site.

Action: Invoke this operation from the specified writer site.

WM_ERROR_268 the new master definition site must be a master site for the group

Cause: An operation related to replication was invoked with a site name passed in as a parameter that is not a master site for the replication group set up for Workspace Manager.

Action: Invoke the operation by passing a master site as the site name for the new master definition site parameter.

WM_ERROR_269 *'string'* is already the master definition site for the group *'string'*

Cause: An attempt was made to change the master definition site to a site which is already the master definition site for the replication group set up for Workspace Manager.

Action: Invoke the operation by passing a different master site as the site name for the new master definition site parameter.

WM_ERROR_270 this operation has to be executed from the old writer site *'string'*

Cause: An attempt was made to invoke a replication related operation, such as DBMS_WM.SynchronizeSite, from a site which is not the old writer site.

Action: Invoke the operation from the old writer site.

WM_ERROR_271 all version-enabled tables at the local site must exist at all remote sites as non-versioned tables

Cause: An attempt was made to set up replication with a mismatch in the set of version-enabled tables between the master definition site and other master sites. Workspace Manager requires that all version-enabled tables at the local master definition site exist as non-versioned tables at all remote sites specified as master sites.

Action: Invoke the operation after ensuring that all version-enabled tables at the local master definition site exist as non-versioned tables at all remote sites specified as master sites.

WM_ERROR_272 invalid event name: *'string'*

Cause: An invalid Workspace Manager event name was passed as an argument to the function.

Action: Pass a valid event name. See the WM_EVENTS_INFO view for a list of all valid events.

WM_ERROR_273 set system parameter 'ALLOW_CAPTURE_EVENTS' to 'ON' for capturing events

Cause: An attempt was made to capture an event even though the Workspace Manager system parameter `ALLOW_CAPTURE_EVENTS` was set to `OFF`.

Action: Call SetSystemParameter to set `ALLOW_CAPTURE_EVENTS` to `ON`, and retry the operation.

WM_ERROR_274 this parameter cannot be set to 'OFF' when some events are set to be captured

Cause: An attempt was made to disallow the capture of Workspace Manager events while one or more types of events were set to be captured.

Action: Turn off event capture by calling `SetCaptureEvents('ALL_EVENTS','OFF')`, and retry the operation.

WM_ERROR_275 invalid value for capture - 'ON' or 'OFF' expected

Cause: The SetCaptureEvent procedure was called with an invalid value for the capture parameter.

Action: Specify either `ON` or `OFF` for the capture parameter.

WM_ERROR_276 this parameter cannot be set to 'OFF' when some multiparent workspaces exist

Cause: An attempt was made to set `ALLOW_MULTI_PARENT_WORKSPACES` to `OFF` when one or more multiparent workspaces existed in the system.

Action: Remove all multiparent workspaces by using any combination of the RemoveAsParentWorkspace, MergeWorkspace, and RemoveWorkspace procedures.

WM_ERROR_277 system parameter 'ALLOW_NESTED_TABLE_COLUMNS' cannot be set to 'OFF' when a version enabled table exists containing a nested table column

Cause: An attempt was made to set `ALLOW_NESTED_TABLE_COLUMNS` to `OFF` when one or more version-enabled tables contained a nested table column.

Action: Disable versioning on all tables that contain a nested table column.

WM_ERROR_278 *'string'* cannot be version enabled because system parameter 'ALLOW_NESTED_TABLE_COLUMNS' has been set to 'OFF'

Cause: An attempt was made to version-enable a table containing a nested table column and the Workspace Manager system parameter `ALLOW_NESTED_TABLE_COLUMNS` was set to `OFF`.

Action: Call DBMS_WM.SetSystemParameter to set `ALLOW_NESTED_TABLE_COLUMNS` to `ON`, and retry the operation.

WM_ERROR_279 histogram stats not found for table *'string.string'* on column *'string'*

Cause: Required histogram statistics have not been collected on the specified column.

Action: Use the DBMS_STATS.GATHER_TABLE_STATS procedure to collect the histogram statistics; then try the operation again.

WM_ERROR_280 datatype of column *'string'* in table *'string.string'* not supported for batch updates

Cause: The specified data type cannot be used for batches of `PRIMARY_KEY_RANGE`.

Action: Specify the batch size as `TABLE`.

WM_ERROR_281 batch_size parameter must be 'TABLE' or 'PRIMARY_KEY_RANGE'

Cause: The batch_size parameter value was invalid.

Action: Specify the `batch_size` parameter value as `TABLE` or `PRIMARY_KEY_RANGE`.

WM_ERROR_282 number of batches must be between 1 and 1000

Cause: The value specified for the Workspace Manager system parameter `NUMBER_OF_COMPRESS_BATCHES` was invalid.

Action: Specify a number from 1 to 1000 (inclusive).

Glossary

active version

See current version.

child workspace

A workspace created from its parent workspace.

See also parent workspace and workspace hierarchy.

conflicts

Differences in data values resulting from changes to rows in the child and parent workspace. Conflicts are detected at merge time and presented to the user in conflict views.

See also merging (a workspace).

context

Information about the workspace that determines what data the session can see in the workspace. The context can be retrieved using the GetSessionInfo procedure

current version

The version in which the changes are currently being made.

exclusive locking

A Workspace Manager lock mode that prevents any other user from changing a locked row.

See also locks.

explicit savepoint

A savepoint that is explicitly created. It can later be used to perform partial rollbacks in workspaces.

See also savepoint, implicit savepoint, and removable savepoint.

freezing (a workspace)

Causing the condition in which no changes can be made to data in version-enabled rows in a workspace, and access to the workspace is restricted.

implicit savepoint

A savepoint that is created automatically whenever a new workspace is created.

See also savepoint, explicit savepoint, and removable savepoint.

LATEST

The name of the logical savepoint that refers to the latest version in the workspace.

See also savepoint.

LIVE

The name of the topmost workspace in the workspace hierarchy.

See also workspace hierarchy.

locks

Version locks provided by Workspace Manager, separate from locks provided by conventional Oracle database transactions. These locks are primarily intended to eliminate row conflicts between a parent workspace and a child workspace. Locking is enabled at a session level and is a session property independent of the workspace in which the session is. When locking is enabled for a session, it locks rows in all workspaces in which it participates.

merging (a workspace)

Applying changes made in a workspace to its parent workspace.

nonwriter site

A master site in a multimaster group in a Workspace Manager replication environment that is not the writer site. A nonwriter site cannot perform any write operations, but can perform all read operations, such as CreateSavepoint or SELECT queries on version-enabled tables.

See also writer site.

parent workspace

A workspace from which another workspace (a child workspace) was created.

See also child workspace and workspace hierarchy.

privileges

A set of privileges for Workspace Manager that are separate from standard Oracle database privileges. Workspace-level privileges (with names in the form *xxx*_WORKSPACE*)* that allow the user to affect a specified workspace. System-level privileges (with names in the form *xxx*_ANY_WORKSPACE*)* that allow the user to affect any workspace.

removable savepoint

A workspace that can be deleted by the CompressWorkspace, CompressWorkspaceTree, and DeleteSavepoint procedures. A savepoint is removable if it is an explicit savepoint or if it is an implicit savepoint that does not have any child dependencies.

See also savepoint, explicit savepoint, and implicit savepoint.

rolling back (a workspace)

Deleting either all changes made in the workspace or all changes made after a savepoint (that is, an explicit savepoint).

savepoint

A point in the workspace to which operations can be rolled back. It is analogous to a firewall, in that by creating a savepoint you can prevent any damage to the "other

side" of the wall (that is, operations performed in the workspace before the savepoint was created).

See also explicit savepoint, implicit savepoint, and removable savepoint.

session context

See context.

shared locking

A Workspace Manager lock mode that allows only users in the workspace in which the row was locked to modify the row.

See also locks.

unfreezing (a workspace)

Reversing the effect of a freeze operation.

See also freezing (a workspace).

valid time

The time during which a record is valid, or the ability to specify the time for which a record is valid. Also called *effective dating*.

valid time filter

A time that is applied to queries against version-enabled tables that have valid time support. When a valid time filter is set for the current session, only rows that are valid for the specified time are returned.

version-enabled table

A table in the database in which all rows in the table can now support multiple versions of data. The versioning infrastructure is not visible to the database users. After a table has been version-enabled, users automatically see the correct version of the record in which they are interested.

workspace

A virtual environment that one or more users can share to make changes to the data in the database. Workspace management involves managing one or more workspaces that can be shared by many users.

workspace hierarchy

The hierarchy of workspaces in the database. For example, a workspace can be a parent to one or more workspaces. By default, when a workspace is created, it is created from the topmost, or `LIVE`, database workspace.

workspace management

The ability of the database to hold different versions of the same record (that is, row) in one or more workspaces.

writer site

The master definition site in a Workspace Manager replication environment. Only the writer site can perform workspace operations and DML and DDL operations on version-enabled tables. All other sites in the multimaster group are nonwriter sites.

See also nonwriter site.

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